

ENVIRONMENTAL ASSESSMENT BOARD



ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 4

DATE: Thursday, April 25, 1991

BEFORE:

HON. MR. JUSTICE E. SAUNDERS CHAIRMAN


DR. G. CONNELL MEMBER

MS. G. PATTERSON MEMBER

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ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act,
R.S.O. 1980, c. 140, as amended, and Regulations
thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro
consisting of a program in respect of activities
associated with meeting future electricity
requirements in Ontario.

Held on the 5th Floor, 2200
Yonge Street, Toronto, Ontario,
on Thursday, the 25th day of April,
1991, commencing at 10:00 a.m.

VOLUME 4

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

S T A F F :

MR. M. HARPUR	Board Counsel
MR. R. NUNN	Counsel/Manager, Informations Systems
MS. C. MARTIN	Administrative Coordinator
MS. G. MORRISON	Executive Coordinator

A P P E A R A N C E S

B. CAMPBELL)	ONTARIO HYDRO
M. PAYNE)	
J.C. SHEPHERD)	IPPSO
I. MONDROW)	
R. WATSON)	MUNICIPAL ELECTRIC
M. MARK)	ASSOCIATION
C. MACALUSO)	
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S. COUBAN		PROVINCIAL GOVERNMENT AGENCIES
C. MARLATT)	NORTH SHORE TRIBAL COUNCIL UNION OF ONTARIO INDIANS UNITED CHIEFS AND COUNCILS OF MANITOULIN WHITEFISH RIVER FIRST NATION
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D. ROGERS		ONGA
R. POWER		CITY OF TORONTO & SOUTH BRUCE
T. ROCKINGHAM		MINISTRY OF ENERGY
C. REID		OMAA

A P P E A R A N C E S
(Cont'd)

L. GREENSPOON	NORTHWATCH
J. M. RODGER	AMPCO
N. KLEER	NAN TREATY #3, et al
T. HILL	TOWN OF NEWCASTLE
J. MONGER	CAC (ONTARIO)
F. MACKESY	ON HER OWN BEHALF
R. HUNTER	ON HIS OWN BEHALF
L. HIGGINS	
M. VERWEGEN	
M. LECLAIR	
J. SNELSON	
N. KELLY	
C. DUPONT	
L. FRANK	
P. MARGOLIAN	

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1 ---Upon commencing at 10:05 a.m.

2 THE REGISTRAR: The hearing is again in
3 session. Please be seated.

4 MR. B. CAMPBELL: Mr. Chairman, just
5 before we continue this morning, I'm advised by my
6 witnesses that there are three matters arising out of
7 yesterday that they have checked that they would like
8 to deal with.

9 We have generally made a practice in
10 hearings of this type that where things like this come
11 up, it's best to clear them up right away and deal with
12 them while the person is still cross-examining and all
13 the information is together on the record. It
14 generally saves confusion later on.

15 So, I propose to continue to follow that
16 practice where I'm so advised by witnesses prior to the
17 hearing that day, and I just leave it to them to speak
18 to the matters.

19 THE CHAIRMAN: All right.

20 MITCHELL PIERSON ROTHMAN,
21 PAUL JONATHAN BURKE,
 LILY BUJA-BIJUNAS; Resumed

22 MR. ROTHMAN: Mr. Rodger, you asked
23 yesterday, the first item is, you asked yesterday about
24 the validation of the LISA model. I've checked and we
25 did in fact run split sample estimations with that

1 model. We used the model to estimate up to 1980 and
2 then used the structure estimated, in that way, to run
3 the 1990, and it performed quite well under those
4 conditions using a root and squared error criterion.

5 It actually caught the cycle in 81-82 and
6 it caught the peak, but it didn't get them as deep or
7 as high as they were, which makes me feel better
8 because I don't want a long-run model to be able to
9 simulate cycles as accurately as I would a short-run
10 model.

11 You also asked how it had done in
12 forecasting for 1990. The answer is that its first
13 forecast for 1990 was for real growth of about nine
14 tenths of a per cent. The actual real growth for 1990
15 in Ontario, according to the Ontario Ministry of
16 Treasury and Economics, which is the official source
17 these days, was plus half a per cent. So that's,
18 again, pretty close.

19 I must say, there's a lot of skepticism
20 among us and others in the economics community about
21 the validity of that plus half a per cent, but that's
22 the official number we've got right now. So, that was
23 the first matter that I wanted to address.

24 The second --

25 MR. RODGER: Perhaps I can ask you one

1 supplementary question to that?

2 MR. ROTHMAN: Sure, sure.

3 MR. RODGER: Based on your review of how
4 well this model performed, have you made any changes to
5 the LISA model for the next forecast period, given your
6 actual results?

7 MR. ROTHMAN: In a model of that size
8 that has only been used for one year, I would expect
9 that there would be several changes between last year's
10 model and this year's model. I don't know what they
11 are and I haven't yet talked to the people who are
12 doing it about exactly what changes have been made.
13 But, I would expect that there would certainly be
14 changes between the first time you use a model and the
15 second.

16 In any case, you are likely to
17 re-estimate the model with another year's data and that
18 can cause changes either in the specification or at
19 least in the parameters. So, the answer would be, I
20 don't know what changes have been made, but I would
21 expect that there would be some changes just in the
22 normal course of events.

23 MR. RODGER: Could you give us any
24 indication of what areas you think might be the subject
25 of the changes? Is there anything that's apparent, or

1 is it just too early to tell?

2 MR. ROTHMAN: In the brief look that I've
3 had at the model structure, I have't seen anything that
4 struck me as requiring changes so I would have to
5 consult with staff to know in which areas they're
6 looking at, in particular, for changes of this type.

7 THE CHAIRMAN: You have to consult with
8 who, sorry?

9 MR. ROTHMAN: With staff.

10 THE CHAIRMAN: Oh, I see.

11 MR. ROTHMAN: The second item is brief.
12 You asked about our comparisons with other forecasts of
13 Ontario GDP, and there's an interrogatory response on
14 that issue, it's Interrogatory 1.9.6.

15 And, finally, I have checked with my
16 staff and my guess about why our age structure of the
17 population was generally lower than that of Statistics
18 Canada was largely due to our higher immigration
19 assumptions.

20 MR. RODGER: Thank you.

21 MR. ROTHMAN: Those are the three items.

22 CROSS-EXAMINATION BY MR. RODGER (Cont'd):

23 Q. I would also like to clear up a
24 couple of matters that we discussed yesterday. One of
25 which is the Free Trade Agreement impact with the

1 Americans. I believe you said that you still agreed
2 with the conclusion in the report that pertained to the
3 competitiveness of Canadian manufacturing, Canadian
4 industry. That conclusion held that Ontario's largest
5 industries are quite cost-competitive and the economy
6 will tend to specialize in industries that are already
7 strong.

8 And then when we talked about the
9 different industries, the primary metals and the
10 electronic products and the transportation sector, I
11 was left unclear as to which industries Hydro thinks
12 will do well under Free Trade with the States?

13 MR. ROTHMAN: A. Yes. Let me just get
14 my copies of those documents again.

15 From that original study, the industries
16 identified as likely to do well included; pulp and
17 paper mills, iron and steel mills, motor vehicles,
18 non-metallic metals industries - that's it - which is
19 cement manufacturing, glass, smelting and refining,
20 other kinds of paper industries, communications
21 equipment and some of the plastics industries.

22 I think that is still a reasonable list
23 and you'll notice that communication equipment is in
24 that list. That is a part of the electrical and
25 electronics products industries. And that is the piece

1 that I think that we see as likely to do well within
2 that industry and part of the reason for the confusion
3 about it.

4 I'm not terribly optimistic about
5 Canada's ability to maintain its strong export-oriented
6 industry in the production of such things as television
7 sets or radio receivers, or any of those kinds of
8 electronic products, but we have had a viable
9 telecommunications industry and I think we can continue
10 to have one.

11 So, that is the list that came out of
12 that study which you have had, and I think by and large
13 that remains a good list.

14 The pieces of primary metals that are in
15 there are smelting and refining and iron and steel
16 mills. I think that Canada's iron and steel mills can
17 remain competitive and will continue to grow, but we're
18 not talking here about growth rates for iron and steel
19 mills of the five and six per cent per year real growth
20 range. We are talking about growth in the range of one
21 to two per cent per year, steadily over a reasonably
22 long period, and I think that is a reasonable forecast.

23 Q. Thank you. Now, yesterday when I was
24 asking you about comparisons of Hydro's long-term
25 economic forecast with the Informetrica model and, as I

1 understand your testimony, the key difference between
2 your model and the Informetrica model - which is also
3 an econometric model - that the key difference was that
4 the Informetrica model forecast Canada as a whole and
5 then, by way of a shared-down approach, that is how
6 they got to the numbers for Ontario?

7 A. Yes.

8 Q. And what made Hydro's approach unique
9 was that Hydro is the only organization that has a
10 long-run econometric model which focuses specifically
11 on Ontario?

12 A. Yes.

13 Q. And am I correct when I say that the
14 reason models like Informetrica, the reasons that they
15 take a share down approach is because there's a lack of
16 available data at the provincial level?

17 A. I would say that the reason that
18 firms like Informetrica take that approach is that they
19 have a lesser direct interest in that kind of modeling
20 than we do.

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24 ...
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1 [10:15 a.m.] Informetrica's major clients are national
2 firms and primarily federal government agencies. They
3 have a strong interest in Canada as a whole; a less
4 strong interest in Ontario, specifically. So, I think
5 that it is more a business decision than one driven by
6 data.

7 We, of course, have a very strong
8 interest in Ontario specifically. We have, as near as
9 I can tell, a stronger interest in long-term forecasts
10 for Ontario than does any other agency or business.

11 And that, for me, is the reason that we
12 have those kinds of models and the reason that we make
13 that kind of modeling effort. It isn't that nobody
14 else could do it. It is that nobody else has as strong
15 an interest in it.

16 Q. Well, with respect to the data, then,
17 that is used, is there a source of real output data for
18 Ontario industry?

19 A. Real output data for Ontario industry
20 are all over the place. Statistics Canada has
21 published data at various times, I think, and some of
22 the data have been concocted at various times. Data
23 for those kinds of forecasts are a problem.

24 MR. BURKE: A. We are not modeling
25 individual industries within the manufacturing sector

1 on an industry-by-industry basis.

2 Effectively, we use the input/output
3 structure for the Ontario economy that is estimated by
4 Statistics Canada to infer industrial structure from
5 the forecast for the manufacturing sector and for the
6 services sectors and so on.

7 LISA, itself, as a macroeconomic model
8 does not get into the individual industry forecasts.
9 It produces a macroforecast for Ontario and then that
10 forecast - and I am not sure, definitionally, whether
11 the input/output framework is considered to be within
12 LISA or not.

13 But nonetheless, the macroeconomic
14 forecast derived is then shared out through the
15 input/output structure. There is a system of equations
16 that takes the static properties of that input/output
17 structure and generates a more dynamic relationship
18 between industries as they evolve over time, in
19 relationship to the static structure that Statistics
20 Canada has estimated in its input/output matrix.

21 Q. So, am I correct then when I say that
22 there is no real output data for industry; that is just
23 not available?

24 A. There is nominal dollar output data
25 for Ontario industry, I believe.

1 I think the only issue is the question
2 for historically. I think the issue is the choice of
3 the deflator and I think it is common practice to use
4 national deflators to apply to the nominal dollar value
5 added amounts by province. I believe that is the case.
6 We could check that.

7 Q. But it sounds like, in any event, it
8 is very ambiguous. It sounds like that in any event in
9 this process of trying to forecast the data, at least,
10 the output data for industry, that it is a very
11 ambiguous process.

12 I mean, there is no clear source you can
13 look to and say, 'I want to find out the actual data
14 output for industry.' There is no...

15 A. No. There is definitely data
16 available. The only issue is the matter of whether you
17 use a national deflator for that industry, and that is
18 considered a reasonable approximation.

19 So, nominal value-added information is
20 available for the provincial accounts by industry. The
21 only issue is whether it is legitimate to deflate using
22 national information.

23 MR. ROTHMAN: A. If you are suggesting
24 that it is ambiguous in the sense that one might choose
25 different deflators and thereby get different series,

1 that is true, but it is largely irrelevant as long as
2 you use a consistent set of deflators and get,
3 therefore, a consistent set of series.

4 You can run into difficulties if you have
5 got one set of people using one set of deflators and
6 another set of people using another set of deflators on
7 the same series, and so you would have data that are
8 incomparable.

9 But what we are interested in is the
10 dynamics. What we are interested is what has happened
11 over time. And as long as the series are reasonably
12 consistent over time - and we trust Stats Canada to do
13 that - then there isn't a serious problem.

14 Q. I wonder, Mr. Rothman, just a minute
15 ago in talking about that you said that to a certain
16 extent, you had to - I believe your words were -
17 concoct the numbers. And I want to be fair. I wonder
18 if you could just complain that?

19 A. I was really thinking about the fact
20 that there aren't real data series; that we do have to
21 use an approximation like taking the national deflator
22 and applying it to the Ontario data.

23 Q. And if there aren't real data series,
24 then how does Hydro go about comparing its forecast to
25 see if this can be accurate and reliable if there is no

1 actual series to compare it to?

2 A. Until recently, there were no Ontario
3 real GDP series that were officially published, but
4 now, the Ontario Ministry of Treasury and Economics is
5 publishing and producing an Ontario real GDP series.
6 That is the aggregate series against which we compare.

7 And they have also published a history,
8 an historical series for that as well.

9 Q. What period does the historical
10 series cover?

11 MR. BURKE: A. It is 1947 on.

12 Q. Thank you.

13 I would like to turn now to the
14 commercial sector electricity demand.

15 And I understand that for this approach,
16 you use two models: You use the EEMO model and the
17 end-use series.

18 I am wondering, with the EEMO model, what
19 is the data series that you are using in that EEMO
20 equation.

21 A. Perhaps I should answer that
22 question. You will find all of the data that is used
23 in the EEMO model in the back of Exhibit 77. I will
24 just check that. Yes, 77.

25 Q. And --

1 A. Would you like me to turn it up for
2 you?

3 Q. No. That is fine.

4 And I take it that that data series is
5 from Stats Can figures; is that correct?

6 A. Which particular series are you
7 interested in?

8 Q. For the energy and the GDP.

9 A. The energy is definitely Statistics
10 Canada and the GDP for services - actually, I referred
11 to this issue in my direct evidence.

12 Back to about 1971, it is Statistics
13 Canada; and for the period 1962 to '71, we have
14 estimated that history using RDP for Ontario and the
15 input/output framework for Ontario that Statistics
16 Canada has produced.

17 Q. For the data that you just referred
18 to that comes from Stats Can, where does Stats Can get
19 its data from? How does it arrive at those figures?

20 A. I think you are pushing my knowledge
21 here. I mean, Statistics Canada gathers value-added
22 information on employment and salaries and so on across
23 Canada, and that is used to determine value added in
24 the service sector.

25 Q. Would it be fair to say that the

1 municipalities might provide that data to Stats Can?

2 A. No. I think it is fair to say that
3 it comes from companies.

4 Q. When I am asking about the figures, I
5 am talking about for the electricity numbers.

6 A. Electricity consumption?

7 Q. Yes.

8 A. You are asking where the electricity
9 consumption for Ontario services comes from?

10 Q. That's right.

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1 [10:25 a.m.] It is supplied by Ontario Hydro to
2 Statistics Canada, and more than that I can't tell you
3 at this point.

4 DR. BUJA-BIJUNAS: A. The information
5 that's supplied to StatsCan comes from Ontario Hydro,
6 and the billing data is labelled by a code which tells
7 you what type of user you are looking at, whether, for
8 example, it's fire or finance, insurance, real estate,
9 et cetera, that information then goes to StatsCan which
10 produces the official number which is published. But
11 the information does come from Ontario Hydro.

12 Q. Can you tell me whether every
13 municipality, does that municipality, when it
14 distributes the electricity, does that divide it up
15 into sector and it says commercial will have X
16 percentage consumption, residents will have this
17 percentage, streetlighting will have this percentage?
18 Is it defined that precisely by the municipality?

19 A. It is not defined that way by a
20 municipality. We don't have a sectoral breakdown,
21 residential, commercial, industrial by municipality.

22 Q. Well, who is it that codes the data
23 into the various categories then of commercial,
24 industrial, residential?

25 A. Ontario Hydro has a listing, a coding

1 which, basically, the industrial customer-specific
2 companies has assigned a coding consistent with what
3 business the company is in and the particular SIC/SRC
4 which is the coding system. When the billings come
5 through these companies maintain that their -- they
6 submit their data using that coding system and that's
7 maintained on a year-by-year basis.

8 Q. Now, am I correct, though, when I say
9 that your comments just now, that only applies to
10 direct customers and not customers that would be
11 supplied through the municipalities?

12 A. No. We do have additional data that
13 does have a disaggregation, by SIC/SRC, which allows
14 that from municipal utilities.

15 Q. I guess the difficulty I am having is
16 I am not sure how StatsCan converts the data so they
17 can say this goes into the commercial sector, this is
18 the data for the commercial sector.

19 A. I don't think StatsCan does that; we
20 do that. When we get our billing data it's all labeled
21 by SIC/SRC classification. That information is
22 analyzed over a prolonged period of time to look for
23 inconsistencies and after all those inconsistencies are
24 cleared up then it goes to StatsCan.

25 MR. BURKE: A. Just to make it clear,

1 for the municipal utility data, they do the
2 classification, that they assign the SIC/SRC numbers to
3 the customers. We have that information.

4 Q. The municipalities, are those the
5 same categories over time or do the municipalities,
6 could they change what goes into particular categories
7 from year to year.

8 DR. BUJA-BIJUNAS: A. Occasionally there
9 is a change. Occasionally, the data is such that a
10 more general coding will be used as opposed to a more
11 detailed coding. How do I explain this?

12 It's the equivalent of using a 999 coding
13 for all others. Sometimes information is printed that
14 classification as opposed to using the correct detailed
15 classification if there is some uncertainty as to where
16 that billing information should go. So, there is some
17 discrepancy from year to year.

18 Q. And is there an information flow
19 between the municipalities and Hydro as to what these
20 changes are?

21 A. Very much so. One thing that is
22 really checking off lot is the change, for example, in
23 commercial consumption from one year to the next. If
24 the billing data comes in and it looks as though
25 something very peculiar has happened over a given year

1 when there seems to be no explanation for it, then the
2 group responsible for these statistics will go and back
3 and try to clear up if there has been a
4 misspecification or mislabeling of some of the billing
5 into their own category.

6 Q. All right. If I could turn to the
7 end-use model that you use for the commercial sector.
8 Am I correct for part of that analysis whereby by you
9 arrive at the total commercial sector demand, you do
10 that by aggregating the data from all the commercial
11 floor spaces by end-user?

12 A. What we do is we aggregate across
13 building types and we have consumption by building
14 type, and we calibrate to make sure the summations of
15 all the consumption by each building type gives the
16 total commercial demand.

17 Q. And as Mr. Rothman described near the
18 end of the day yesterday when I asked him to go through
19 the commercial sector, he defined the various
20 components such as schools, offices, retail, et cetera,
21 et cetera, those are the end-uses that you are
22 referring to, I take it?

23 A. There is not a direct correlation
24 between building type and SIC/SRC classification. For
25 example, you it might have various types of services

1 which are classified under different SIC/SRC listings
2 that are located in offices.

3 When we analyze energy use we look at a
4 building type but that building type might provide
5 services across different SIC/SRC classifications. So
6 in general, our analysis follows what Mr. Rothman said
7 but we do disaggregate in a somewhat different way so
8 we can be more specific in physical terms.

9 Q. I wonder if you could look at AMPCO
10 Interrogatory 1.24.33, please. I have some extra
11 copies if you can't locate yours.

12 In this interrogatory, AMPCO asked Hydro
13 if they would please provide the data sources used to
14 estimate total electricity consumption for the
15 commercial sector in Table 4.1.2.3, page 43, load
16 forecast '90. And part of the response was that the
17 table just referred to lists the commercial electricity
18 consumption by end-use for the years 1988 and 2015.

19 I understand from this interrogatory
20 response that no actual figures exist for individual
21 end-uses in the commercial sector; is that correct?

22 A. Yes. I think we are talking at cross
23 purposes. It is very true no figures exist for
24 end-uses; figures exist for end-users, not the same
25 thing.

We don't have individual metering data for air conditioning or individual metering data for office equipment. We have billing data for different types of users. So what we do is knowing square footage and typical energy use for equipment tupe, we then look across at square footage, multiply it through and get consumption by end-user that we match with statistical data.

Q. Now, the end-uses data, that is used by Hydro in the end-use analysis, though, isn't it?

A. Yes. When I say the end-uses I am referring to how much electricity is used in lighting the entire commercial sector. And what we do is that we look at the various building types and, for example, how much square footage there is in offices and typically the kilowatthour per square foot of an office building.

• • •

1 [10:35 a.m.] The kilowatthour per square foot of an
2 office building is obtained through many different
3 sources, including U.S. studies, et cetera. From that
4 you can get the lighting for offices. You aggregate up
5 all the other end-uses in offices, get an office
6 consumption which is then compared to statistics.

7 Q. So my question then, similar to the
8 EEMO model, is that if there is no actual sources for
9 these end-uses then how does Hydro go about comparing
10 how their estimates compare?

11 A. Okay. What we have done is that
12 knowing what the consumption is by building segment and
13 knowing the square footage, we have derived that
14 particular EUI, which are energy use indices, the
15 kilowatt hours per square foot, so we have some
16 estimates from that.

17 We compare that to the same sort of
18 estimates provided by Northeastern Utilities, for
19 example, Electric Power and Research Institute, by
20 Synergy, a consulting firm that has extensive audits,
21 to see if our estimations are consistent with similar
22 areas providing similar services. That's how we derive
23 our end-use consumption numbers.

24 Q. And how has that analysis, how has
25 your estimates, how have they compared to that analysis

1 you just described?

2 A. If you look at the energy use indices
3 by end-use across various jurisdictions, there's
4 actually quite a range in these values even across
5 jurisdictions that might be in the same climate zone.

6 Certainly the EUIs that we use are within
7 the range of the various EUIs that we have come across
8 from other utilities and other research groups.

9 Q. Now, since the commercial sector is
10 such an important part of your overall forecast, for
11 planning purposes, would it be helpful if you could
12 have those actual figures to work with?

13 A. Yes, that would be very helpful. It
14 would be quite an extensive undertaking to do such a
15 thing, but certainly I don't think anybody can question
16 the fact that having a significant increase in data
17 would assist the modeling exercise.

18 Q. And has Hydro in the past, or has it
19 done any studies to see how it would go about getting
20 those actual figures?

21 A. Hydro has put in quite an effort
22 recently in trying to increase our knowledge of the
23 commercial sector.

24 There were two surveys that were carried
25 out, one of the office segment and one of multi-res,

1 and they were done within the last two years or so
2 where they did extensive -- for the office segment, for
3 example, they took 403 offices and did very extensive
4 analyses of the sort of equipment installed inside of
5 each of these offices to do a more proper accounting of
6 what's going on.

7 So, the initial steps have been taken
8 but, I agree, certainly a lot more data would
9 facilitate doing this analysis.

10 Q. And do you know if there has been
11 policy directions within Hydro that this is a matter
12 which they're going to continue to develop, an aim of
13 achieving those actual figures at some point; is that a
14 policy of Hydro?

15 A. Certainly, for example, there have
16 been more and more Synergy audits of commercial space
17 and that data is data that we take advantage of.

18 I would certainly say during the last few
19 years there has been a marked increase in the amount of
20 data available from within Hydro that we can use in our
21 end-use analysis. What I will say is that the
22 commercial segment is an extremely difficult segment to
23 analyse and, therefore, data is difficult to collect
24 because there are a lot of ambiguities about commercial
25 space.

1 Q. Maybe we can talk about one of those
2 ambiguities and that is in connection with productivity
3 growth. We talked about that yesterday and Mr. Rothman
4 indicated that Hydro anticipated that in the short-term
5 and long-term, I believe, that he anticipated that
6 productivity growth would increase.

7 Am I correct in that, Mr. Rothman?

8 MR. ROTHMAN: A. Yes.

9 Q. And you said yesterday that
10 productivity growth means output per worker, but it
11 also impacts on the amount of floor space that is going
12 to be required for the commercial sector. Is there a
13 connection there; is that true?

14 A. I don't know that there's a necessary
15 connection. In the services sector one would expect
16 that -- most people who talk about productivity growth
17 in the services sector typically attribute the
18 increasing computerization of the sector as one of the
19 reasons for the productivity growth.

20 Adding a computer to most people's office
21 does tend to increase average floor space per employee
22 so there's a tenuous connection there, but it isn't an
23 essential one.

24 Q. I was thinking more of a situation
25 where, for example, in the past perhaps it took eight

1 clerks sitting in a row or whatever to do a particular
2 job, and now it may take two people with computers to
3 do that same job. It is an increase in productivity
4 growth and I would suggest that the impact of that is a
5 change in the amount of floor space that is going to be
6 required.

7 A. As I suggested, to take your example,
8 it's likely that the two people with computers would
9 each have more space than the eight clerks who didn't
10 have computers, but it's not a big difference and, yes,
11 it is likely that the floor space per worker will
12 increase in consequence of more capital-intensive ways
13 of production, even in this services sector.

14 MR. BURKE: A. Well, maybe I could just
15 add a little fact to this. We have a forecast of floor
16 space in the end-use section and I think - I was just
17 about to turn it up - I think it grows of the order of
18 1.2 per cent is that -- about 1.2 per cent per year
19 over the forecast period.

20 Value added for the commercial sector is
21 growing around 2.8 per cent, 2.9 per cent over the
22 forecast period, so clearly value added per square foot
23 is rising in the forecast.

24 Q. I wonder if I could ask you to turn
25 to AMPCO Interrogatory 1.24.29, please.

1 A. I have that, yes.

2 Q. And, in this question, my client
3 asked you to provide a single equation forecasting
4 model used to forecast commercial floor space by
5 building type in table 4.1.2.1, page 40, load forecast
6 No. 891211 April, 1990.

7 If you could turn over to the second page
8 of the response to that interrogatory and the chart at
9 the bottom of that page is entitled "LS Dependent
10 Variable is LSOFF." I understand that's the single
11 equation, that's the analysis for the office space
12 calculation; is that correct?

13 MR. ROTHMAN: A. Yes.

14 Q. And the left-hand column, there are
15 the letters LCBPS. And I understand that's real
16 service output?

17 A. That's community business and
18 personal services, yes.

19 Q. Does that translate to real service
20 output?

21 A. Not total service output but that's
22 community business and personal services.

23 Q. It does go to outputs -- the GDP?

24 A. Yes.

25 Q. Okay. And below that --

1 A. It's GDP in the community business
2 and personal services sector, if you like.

3 Q. Okay.

4 A. Or two-digit level industry.

5 Q. Okay. And below that you have a lag
6 variable?

7 A. Yes.

8 Q. And below that I believe LPOPO is
9 population in Ontario?

10 A. Yes.

11 Q. Below that you have two lag
12 variables?

13 A. Yes.

14 Q. And finally you have LGDPO, and I
15 believe that's Ontario's total output?

16 A. Yes.

17 Q. So the factors here emphasize output?

18 A. Yes.

19 Q. My question is. If the emphasis is
20 on output, then how does this single equation, how does
21 it pick up the productivity growth?

22 MR. BURKE: A. We have both output and
23 population in this equation. Population is probably a
24 reasonable proxy for trends in labour force.

25 Essentially the equation will pick up.

1 If there's an underlying trend in productivity per unit
2 of floor space, that is something I think that this
3 equation could reasonably be expected to pick up, given
4 that it has output variables in it.

5 Q. I wonder if you could just expand on
6 that, because I don't quite understand that. I don't
7 understand how the --

8 A. Productivity is a combination --
9 sorry, GDP, as Mr. Rothman explained it in his direct,
10 can be decomposed into labour force times output per
11 worker and productivity using output per worker in that
12 sense. So, within the GDP data, within the output data
13 is both the trend in number of workers and output per
14 worker combined.

15 If it's the productivity portion of that
16 that is changing most significantly, then the equation
17 should be able to pick up that trend.

18 Q. Has Hydro done any analysis to see
19 how accurately this single equation does pick up the
20 productivity growth in past years?

21 MR. ROTHMAN: A. We've struggled a bit I
22 think with these equations. The problems as you're
23 suggesting are that we are trying to find correct
24 specifications for these equations. I, in fact this
25 morning, was reviewing this equation or an equation

1 like it that I have with the person who did it and I
2 said: Why do you have only community business and
3 personal services here, why don't you have finance,
4 insurance and real estate here as well, because that
5 is another major user of office space, the finance
6 sector and it isn't in here, why only community
7 business and personal services.

8 And the answer that I got was: Well, we
9 tried all of that, we tried it with all of these
10 variables and the ones that we pick are the ones that
11 work best. Community business and personal services
12 highly co-linear in here with finance, insurance and
13 real estate, and if you put them both in it is very
14 hard to identify what's going on at all.

15 So you get a better equation by picking
16 the one that works best and leaving out the one that
17 doesn't work.

18 And I think that is the same kind of
19 thing that we've suggested that goes on with a lot of
20 these equations. We keep trying to improve the
21 specifications of the equations and simply improve them
22 in terms of the kind of performance that you get when
23 you estimate the equations. But I don't think that we
24 have used, as one of the criteria about the performance
25 of the equation, whether or not it has picked up

1 productivity improvement in the commercial sector,
2 largely because that is just such a difficult number to
3 get a handle on in the first place that I just
4 didn't -- it really hasn't been something that we have
5 been able to focus on at all and it isn't one of the
6 criteria that we would use.

7 What we would be interested in out of
8 this equation, and it is something that we have looked
9 at, what we're interested in is something like what's
10 happened to floor space per employee in the commercial
11 sector.

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1 [10:50 a.m] But even that is, to some extent,
2 difficult to get numbers on because it is not quite so
3 easy to get at numbers on total employees by those
4 industry breakouts.

5 Q. And how does that analysis of
6 productivity growth - how does that translate to the
7 end-use model in that analysis? How is productivity
8 growth picked up in that?

9 A. As I said, I will let Mr. Burke
10 continue with this, but as I said, we have certainly
11 been aware - or Dr. Buja-Bijunas - we are certainly
12 aware in making the floor space forecast because that
13 is what drives the commercial sector, absolutely - we
14 are certainly aware in making the floor space forecast
15 of the trend in space per employee.

16 Now, as I said, I think the relationship
17 between space per employee and productivity growth -
18 that is growth in output per employee - is tenuous at
19 best.

20 I can tell a story, as I have just done,
21 that suggests that growth in space per employee would
22 be linked with increases in output per employee.
23 I can probably, if you give me a little while, think of
24 stories that go the other way.

25 The history has been that space per

1 employee in offices has been growing and that is what
2 our forecast has and that is what influences the
3 commercial end-use forecast.

4 Dr. Buja-Bijunas, do you want to talk a
5 little more about that?

6 DR. BUJA-BIJUNAS: A. If you look at the
7 GDP per square foot ratio that is underlying the
8 forecast, there certainly is an increasing trend
9 throughout the forecast for the key sectors, such as
10 offices and retail, and institutional. So, we are
11 looking at, if you want to call it that, more output
12 per square foot underlying the forecast.

13 One of the things that we have found is
14 that there is this variation in output per square foot.
15 It is not as though it has stayed constant historically
16 or it is expected to stay constant in the future, and
17 that makes some of the analysis somewhat difficult and
18 points to why we like to do an analysis in very
19 physical terms in terms of square footage.

20 It is like trying to analyse the
21 implications of GDP, which is really salaries per
22 square foot. What does that really mean in terms of
23 productivity? You can actually have things, as Mr.
24 Rothman said, going up and down. We like to keep in
25 very, very physical terminology.

1 Q. Now, Mr. Rothman, did you just say
2 that your prediction was that in terms of increases of
3 square feet in the office sector, that that was going
4 to be increasing in the future?

5 MR. ROTHMAN: A. Square feet per
6 employee -- yes, square feet is increasing, yes; total
7 square feet in the commercial sector is increasing,
8 yes.

9 Q. I wonder if you could turn to Exhibit
10 17, please, which is the 1990 commercial sector end-use
11 forecast appendix. And it is the last page on section
12 2 that I am interested in, which is entitled, "Floor
13 Space Forecasts."

14 THE CHAIRMAN: Sorry, Mr. Rodger, give us
15 the page again, please.

16 MR. RODGER: Yes. It is section 2 and
17 there is no page number on here. It follows table 7,
18 which is about almost halfway through the document.

19 THE CHAIRMAN: Section 2, "Floor Space
20 Forecasts"?

21 MR. RODGER: Yes, that's correct.

22 Q. And just so I understand this, the
23 first chart on section 2 is total floor stock millions
24 of square feet for 1990 forecast.

25 And we have got the total under the total

1 column, which is the far left; you have got that
2 increasing from 2604.55 in 1990 to 3678.93 in 2015.

3 Now, to come up with these totals, how
4 are the results from the EEMO and the end-use model
5 combined or - I take it --

6 MR. BURKE: A. I think there must be
7 some confusion because the EEMO model has nothing to do
8 with this whatsoever. The EEMO model does not use
9 square footage in its forecast; only the end-use
10 model --

11 Q. Isn't that part of the output that
12 goes into the single-line equation?

13 A. No. You had me fooled a few minutes
14 ago. I thought you were about to ask me about the EEMO
15 model, but in fact, you asked me about a model which
16 forecasts floor space for the office sector which is
17 used to drive the end-use model.

18 But the EEMO model is a total sector
19 model of the commercial sector. It does not get into
20 building types and it does not use floor space. And
21 the equations for it it are given at the back of
22 Exhibit 77 and were not the ones you turned me to.

23 But, the floor space projections are
24 separately forecasted by the economic forecast unit,
25 bearing in mind GDP and the various variables they have

1 at their disposal, and they were the ones that were
2 given to you but they are not part of EEMO.

3 Q. Okay. I think part of my confusion
4 comes from -- am I right when I say that the GDP
5 numbers used in the end-use commercial model come from
6 the input/output tables?

7 DR. BUJA-BIJUNAS: A. Okay. The end-use
8 commercial model does not directly use GDP numbers.
9 The end-use commercial model is a very physical model
10 when we do accounting of floor space in square footage
11 terms as an indicator of electricity usage. So, we
12 don't directly use GDP.

13 The GDP numbers may be used to derive the
14 floor space numbers by building type, based on sort of
15 services, activities normally provided in that
16 particular building type.

17 So, there are a few steps in between the
18 GDP numbers and the floor space, but it is only the
19 floor space in physical terms that goes into end-use.

20 MR. ROTHMAN: A. And as Mr. Burke said,
21 it is the economic forecasts unit that is responsible
22 for providing those floor space forecasts.

23 Those floor space forecasts are provided
24 by a series of single-equation regressions used as
25 forecast models. On the right-hand side of some of

1 those equations is sectoral GDP of various kinds or
2 aggregate GDP. On the right-hand side of others of
3 them, in some cases, are simply population numbers.
4 And the outputs of those equations are then, in some
5 cases, adjusted judgmentally.

6 We agree that you can't take something
7 like a single-equation model running off the LISA GDP
8 forecast and blindly use it as a forecast of an
9 activity variable like floor space in those sectors.

10 And if you're trying to get me to say
11 that I don't think that those equations are perfect
12 forecasters, then we could have saved a lot of time. I
13 don't think those equations are perfect forecasters. I
14 think those equations are the best forecasters we can
15 come up with and we certainly try to improve them all
16 the time.

17 And I think they are good forecasters. I
18 think they are as good, or better than, any other
19 forecasters anybody else has, but I don't think they
20 are perfect.

21 MR. RODGER: Thank you very much, panel.

22 I have no further questions for this part
23 of my cross.

24 THE CHAIRMAN: Thank you, Mr. Rodger.

25 Mr. Mark, are you ready to start?

1 MR. MARK: I am, Mr. Chairman.

2 THE CHAIRMAN: Do you have any logistical
3 things you have to work out? I mean, should we take
4 the morning break early or do you want to get started?

5 MR. MARK: That is fine. We could use
6 five minutes, so we can take the break.

7 THE CHAIRMAN: Why don't we take the
8 morning break and then come back.

9 THE REGISTRAR: We will recess until
10 11:20.

11 ---Recess at 11:04 a.m.

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1 ---On resuming at 11:23 a.m.

2 THE REGISTRAR: This hearing is again in
3 session. Please be seated.

4 THE CHAIRMAN: Mr. Mark?

5 MR. MARK: Thank you, Mr. Chairman.

6 Just before I begin, Mr. Chairman, I
7 should alert you, you gave some sense of a schedule the
8 other day. I anticipate that I will be at least the
9 balance of the day. No guarantee, but that's my
10 expectation, just so you will know.

11 Secondly, we are going to be referring to
12 a number of interrogatories, and we have furnished
13 those to the panel, and they are some on the table,
14 about five back, for anyone who wants to pick up the
15 ones we will be referring to.

16 As well, we have prepared a selection of
17 our own exhibits which tend to be graphs derived from
18 data which is already on the record. Those have been
19 furnished to you, Mr. Chairman, and your colleagues. I
20 have given them to the witness panel and there are
21 copies available back a few rows for others to pick up,
22 if they wish.

23 THE CHAIRMAN: It might help, just for my
24 purposes, if you would identify the expert who is with
25 you at the table.

1 MR. MARK: Surely. With me is Dr. Adonis
2 Yatchew who is a professor in the Economics Department
3 of the University of Toronto who specializes in
4 economics and econometrics, and he has been assisting
5 the MEA. He is, for your information, our research
6 director as well. He is acting as an analyst on this
7 panel, in addition.

8 I'm sorry, I am reminded he is an
9 associate professor.

10 THE CHAIRMAN: Do you wish these graphs
11 that you have given made an exhibit? Would that be a
12 useful thing to do?

13 MR. MARK: I think it would be. I expect
14 to use them all. If we don't at the end of the day we
15 can always take out anything that I don't get to. If
16 we could then have that as the next exhibit.

17 THE CHAIRMAN: Number?

18 THE REGISTRAR: 102, Mr. Chairman.

19 THE CHAIRMAN: Thank you.

20 ---EXHIBIT NO. 102: MEA Graphs

21 MR. MARK: They are numbered by pages,
22 Mr. Chairman.

23 CROSS-EXAMINATION BY MR. MARK:

24 Q. Mr. Burke, if I could just start with
25 you please. I want to establish just something simple

1 at the outset and make sure I have it correctly.

2 The adjustments you make to get from
3 basic to primary forecast, the reductions for natural
4 efficiencies and load displacement, your branch doesn't
5 generate those numbers, do they? They are provided to
6 you from elsewhere in the corporation?

7 MR. BURKE: A. Well, I would first like
8 to go back to clarify your question. You said
9 something about natural efficiencies going toward the
10 primary?

11 Q. No, perhaps I misspoke. I think we
12 all understand that what you subtract from the basic to
13 get to the primary is, in fact, the ones which are
14 prompted by actions taken by Hydro, so with that
15 correction.

16 A. Yes. Those numbers are derived
17 through a joint process that involves the economics and
18 Forecast Division, Energy Management Branch and System
19 Planning Division, and so they are not our sole
20 responsibility.

21 Q. I noted in your evidence in-chief,
22 and, I think, in your prefiles, that the documents for
23 your panel don't deal with the modelling, for example,
24 and the other calculations which go into the
25 preparation of those numbers, am I correct? I just

1 want to make sure where we are going to be dealing with
2 this, I guess is my question.

3 MR. B. CAMPBELL: Well, we will be
4 dealing with that difference, I think we have tried to
5 be quite clear about it, we will be dealing with that
6 difference on Panel 4 and Mr. Burke will be back on
7 that panel to make his contribution to that discussion.

8 MR. MARK: All right, very well. Let me
9 move on then.

10 Q. Mr. Burke, am I correct from the
11 evidence that you have given before that it is fair to
12 say that the primary driver of load growth in Ontario
13 is GDP?

14 MR. BURKE: A. We have indicated that in
15 various places that it is important to take a
16 disaggregated perspective to the forecasting of load
17 for the long-term, and that is why we use
18 multi-equation econometric models and end-use models to
19 do this.

20 GDP, if by that you mean a single
21 variable, the total output of Ontario, if I were to use
22 a single equation model, it would be the single most
23 important variable in it. And certainly components of
24 GDP, one way or another, as we were discussing this
25 morning, drive components of the forecast. But I think

1 we have choosen not to produce our long-term forecast
2 on the basis of a single equation model with GDP in it
3 as a major driving variable.

4 Q. I am not suggesting it's the only one
5 but is it a fair characterization that it appears to be
6 the primarily driver of load growth?

7 A. I think it is fair to say that when
8 you analyse, you can analyse load growth in terms of a
9 decomposition between GDP growth and electricity growth
10 per unit of GDP, just like you can analyse GDP as Mr.
11 Rothman did by looking at labour force growth and
12 output per worker, but that is a simplification of how
13 we do the forecast, and you can look at it that way.
14 It is a large variable but I don't think it's fair to
15 say that that is how we get the forecast.

16 Q. I didn't suggest that. Let me try it
17 slightly differently. Of all the variables you may
18 look at, the strongest correlation appears GDP?

19 A. Well, this is my point. We don't
20 look at aggregate GDP in preparing our long-term
21 forecast. There are lots of results we can infer
22 relative to aggregate GDP having produced the forecast
23 the way we produce it, and we do certainly have single
24 equation models that have GDP as an explanatory
25 variable which we use for the short-term, but we are

1 deliberately not using that approach for long-term
2 forecasting.

3 Q. Indeed, I think you made mention in
4 your evidence in-chief that the intensity of
5 electricity to GDP is really just an output; it is a
6 consequence of your other conclusions.

7 A. I think to view it that way is very
8 constructive.

9 Q. If you could turn, please, Mr. Burke,
10 to page 1 of Exhibit 102.

11 Mr. Chairman, I am going to have it put
12 up on the overhead as well for ease of reference.

13 Mr. Burke, you will see that this charts
14 graphically -- do you have it, Exhibit 102?

15 A. I didn't realize this was Exhibit
16 102.

17 Q. Yes, we have made that Exhibit 102.

18 MR. B. CAMPBELL: I think that was done
19 at the time that Mr. Burke's binder was falling apart,
20 so he has got it marked now, we can proceed.

21 MR. BURKE: Excuse me.

22 MR. MARK: Q. You will see, Mr. Burke,
23 that this puts on the graph electricity consumption in
24 terawatthours and gross provincial product in billions
25 of dollars measured in 1981 dollars.

1 MR. BURKE: A. Yes.

2 Q. And the figures have been derived
3 from Exhibit 15 and I should also tell you that with
4 respect to the last two years, we have taken the actual
5 figures from your OEB files. Just looking at it, do
6 they appear accurate?

7 A. Just looking at the picture?

8 Q. Yes.

9 A. Let me just check something.

10 I am sorry to take this time, I just want
11 to make sure we are dealing with the same sort of
12 numbers.

13 I guess what I am trying to figure out is
14 whether your scaling has been so effective to mask an
15 effect which exists in the real data, and I think it
16 has been.

17 Q. I'm sorry, you have no quarrel with
18 the numbers, I take it, or at least that you can see
19 offhand?

20 A. Yes. Certainly for GDP they seem
21 okay and for load they seem about right, yes.

22 Q. Does this graph not indicate a rather
23 strong correlation between growth in GPP and growth in
24 electricity consumption?

25 A. Yes, historically that is correct.

1 Q. And in fact, I am advised, and it
2 would appear from this graph, Mr. Burke, that the
3 correlation is something in the area of 95 per cent or
4 higher?

5 A. Certainly single equation models get
6 a very high -- expend a very high proportion of
7 variation of GDP.

8 Q. You don't quarrel with the number I
9 mentioned offhand?

10 A. Offhand, no.

11 Q. And if you could turn, Mr. Burke,
12 please, to page 2 of Exhibit 102, you will see here
13 that this charts over the period 1965 to 1990 the
14 percentage changes in electricity consumption and
15 percent change in gross provincial product?

16 A. Yes, that looks familiar.

17 Q. And you will agree with me, Mr.
18 Burke, that they also seem to track extremely closely?

19 A. Well, as I pointed out in my direct
20 evidence there is a trend in the way they track, and
21 that is that for the period '65 to '75 GDP tended to
22 grow more slowly than load by a noticeable amount, and
23 that from the period about 1976 through to 1990 the
24 average of these growth rates would be -- the average
25 of the ratios of the growth rates would be pretty well

1 one.

2 Q. And that's the point, since '75 until
3 today, 15 or 16 years, we have in fact had a pretty
4 level ratio.

5 A. Yes, over the last 15 years it has
6 averaged about one.

7 Q. And do I understand your evidence
8 in-chief to be that you are now projecting a decrease
9 in that ratio for some period of time over the future?

10 A. Yes, the basic forecast in the long
11 run has a ratio that is less than one.

12 Q. Am I correct that if it was a ratio
13 of one, you would see a one per cent change in
14 electricity consumption for every one per cent change
15 in GDP?

16 A. Well, this is where we start to get
17 away from the simple model. Clearly, there are other
18 factors that will affect load growth in the long-term.
19 I think you have to be careful about what it is you are
20 stating.

21 Q. In fairness, I will state it again.
22 I am not suggesting that you don't properly look at
23 other variables, but --

24 A. I mean, there are other quite macro
25 variables like the price of electricity itself, setting

1 aside any disaggregation of anything which will affect
2 the forecast in the future.

3 Q. Quite right. But in fact over the
4 past 15 years it seems that GDP has a much stronger
5 correlation to load growth than price.

6 A. Yes. But really what we are seeing
7 is the offsetting results of several factors that net
8 out to this relationship here.

9 There has been price change in this
10 period, and I particularly pointed out that in 1976 and
11 '77 there were significant price increases in
12 electricity. These price changes would have dampened
13 electricity demand. GDP as a factor by itself would
14 probably have acted to offset that to some extent.
15 There are all kinds of ways in which the composition of
16 GDP might have changed, and so on.

17 That tended to have the effect -- that
18 net of the effects of prices we ended up in the
19 situation we actually observed. It certainly wasn't
20 uniform over the period; as we pointed out as well,
21 there were periods where the ratio was much less than
22 one and there recently have been periods where it has
23 been much more than one.

24 I think one has to be very careful what
25 one draws by way of simple inferences about the

1 relationship of GDP to load.

2 Q. It is nonetheless true that despite
3 these price changes that we have seen, rather marked
4 ones, you still see it as very strong and level
5 correlation between GDP and electricity consumption
6 over what can fairly be said to be a fairly long period
7 of time, 15 years.

8 A. Yes. If one makes the point of
9 excluding any other variables, one can still get a good
10 relationship between GDP and load, but in fact for
11 forecasting purposes of matters a lot, what you include
12 and what you exclude.

13 Q. And the output of your modelling
14 exercise, as I understand it, is that you see the
15 intensity decreasing to .9 over some future period?

16 A. That's roughly correct.

17 Q. And getting back to the question I
18 did ask a few moments ago, if you were to assume the
19 level intensity of about one that we have seen until
20 now, would you get a one per cent change in load growth
21 for a one per cent change in GDP, other things being
22 constant?

23 A. Other things equal, yes. That's the
24 part you didn't say before.

25 Q. Fair enough. But you, nonetheless -

1 and I think it correctly, do I not - that you see that
2 one per cent to one per cent not being maintained
3 through the 1990s?

4 A. Well, we did present to you results
5 from the EEMO model which had income/output elasticity
6 results which do hold other things equal and were an
7 excessive one.

24 ...

1 [11:40 a.m.] Q. Yes.

2 A. In preparing the recommended
3 forecasts, we do not stick with the EEMO result, in
4 fact we lower it. We adjust that forecast taking into
5 consideration the end-use results - or maybe you should
6 really put it the other way around - we adjust the
7 end-use forecast taking into consideration the EEMO
8 results.

9 But if I had to give an elasticity for
10 what I would expect the GDP relationship to be, other
11 things equal, I would give the one that econometric
12 model has produced.

13 What you are giving --

14 Q. Is that the 1.08?

15 A. That's 1.08, and there are other
16 factors which are acting to decrease that effect; that
17 is, we don't get a result after all we do which
18 corresponds to that, we get something that's less than
19 that.

20 If all you're doing is dividing the ratio
21 between load growth and GDP, we don't get that answer,
22 but if you ask me, what is my best estimate of an
23 income elasticity at this point, it's 1.08. It doesn't
24 help you very much.

25 Q. So you say. Let me ask something

1 which I think is simple, and let's see if we can deal
2 with it. Do you say that, over the 1990s, you will not
3 see a one per cent to one per cent correspondence as I
4 suggested?

5 A. Our load forecasts for the 1990s
6 grows slightly less than our GDP forecast for the
7 1990s.

8 Q. And that is the .9 versus the 1.0?

9 A. Well, the .9 value is an average but,
10 yes, it's close. And as we have said many times, that
11 is the resultant of a large number of factors, not just
12 we took GDP and multiplied by .9.

13 MR. MARK: Just a moment, Mr. Chairman,
14 if I might.

15 MR. ROTHMAN: Mr. Mark, while you are
16 looking things up, if I could add just a couple of
17 things here.

18 The first is to observe that although we
19 would expect that ratio to be .9 over the decade, as
20 Mr. Burke has said, that doesn't mean that we would
21 expect it would not be above one in any given year or
22 at any given time, there is some cyclical variation to
23 that ratio and we expect cycles to occur in the 90s, we
24 don't know exactly when, and so we would expect that
25 that ratio would vary year by year, but would average

1 to .9 over the period.

2 The second observation would be to say
3 that we have said, both Mr. Burke and I have said, in
4 our evidence-in-chief, that we do not simply look at
5 past trends and forecast them to continue. This is yet
6 another example of the fact that we look at these past
7 trends, we try to understand the reasons for them and
8 what variables were underlying that past history in
9 order to be able to make a better forecast of the
10 future.

11 MR. MARK: Q. Mr. Burke, I think the
12 other day in evidence you stated that your short-term
13 models or your short-term forecast for the rest of the
14 1990s did in fact show a result of a one per cent
15 change in load growth for every one per cent change in
16 GDP.

17 MR. BURKE: A. What I said was that
18 compared to the 1980s the potential growth for the
19 1990s was about one per cent lower and that similarly
20 for load, compared to the 1980s, the load growth rate
21 for the 1990s would be about one per cent lower which
22 is effectively an application of the elasticity result
23 and in the 'about' I'm including the 08 sort of factor.

24 So that having reduced GDP potential
25 growth rates, if I'm going to use that elasticity, if

1 that was the only thing that changed between the 80s
2 and the 90s - which is not the case - but, nonetheless,
3 you would expect roughly speaking that the one per cent
4 difference in the average growth rate for potential GDP
5 would translate into roughly one per cent difference in
6 the load growth rate for the 1990s, and that is, as I
7 recall, what I said.

8 Q. And you spoke before about the
9 apparent reduction in intensity back in the 70s from a
10 level of about 1.3 to 1.0. Do I have those numbers
11 correct?

12 A. Yes.

13 Q. All right. And is that change fairly
14 attributable to the price shock that we experienced in
15 that decade?

16 A. I think Dr. Buja-Bijunas in her
17 testimony, using the results of Interrogatory 1.7.14,
18 gave a rather exhaustive description of the sorts of
19 things that have gone on to account for the change in
20 intensity between the 70s and the 80s and into our
21 forecast period.

22 Now, some of those may have been driven
23 or accentuated by the price change that occurred in
24 electricity, but some of them, like the composition of
25 the industrial sector and the composition of the

1 service sector, I doubt, was influenced by the
2 electricity prices, and so you would have to search
3 hard inside that response for that component which, if
4 you're trying to explain intensity trend changes, is
5 sensitive to a shift in price.

6 I don't know whether you...

7 Q. But the shift you had there was a
8 shift in the price of oil?

9 A. Well, price of electricity, I
10 thought, was what you were referring to.

11 Q. In the result it was, but the
12 instigating factor was the shift in the price of oil?

13 A. Instigating factor of what, I'm
14 sorry?

15 Q. Was the 1.03 a constant or fairly
16 constant figure over some period of time?

17 A. The 1.30.

18 Q. Yes, I'm sorry.

19 A. 1.35 is a ratio applied pretty well
20 from 1960 through to '75.

21 Q. So despite a lot of factors it seemed
22 to find a level at any rate amidst a number of
23 competing forces?

24 A. In the period 1960 to '75 there was
25 almost no real price change for electricity or oil and

1 gas. If anything, both were declining slowly in real
2 terms.

3 Q. Yes. And the real major difference
4 that we can see in the economic regimes between the
5 times when it was .30 and then 1.0 is the price shock
6 of the 1970s, the oil price shock?

7 A. The oil price shock.

8 Q. Yes.

9 A. Well, according to our results
10 certainly there was an oil price shock, what its impact
11 on electricity demand was is not particularly clear.

12 Our estimates, as we have analysed them
13 over the period '62 to '89 in the EEMO model, suggests
14 the cross-price effect was zero for the pure price
15 effect from the oil shocks. The effect when it
16 occurred was through the income side, through lower GDP
17 growth induced by the adjustment to higher oil prices.
18 Probably the price of electricity change had more
19 effect on demand for electricity in the period since
20 1975.

21 It's one of the interesting facts of
22 trying to model this thing of load, that people have
23 great difficulty getting significant relationships
24 between oil and gas prices directly and electricity
25 demand.

1 Q. Sorry. Are you suggesting that the
2 price -- the oil price shock didn't affect the
3 intensity?

4 A. Effectively that is what I'm saying,
5 the price itself didn't, it was the income effect
6 associated with the price change that made a
7 difference. But since we're looking at something
8 relative to GDP, that matters to this calculation.

9 Q. That's right. We have looked at GPP
10 somewhat and we've talked now about energy prices. Is
11 it fair to say that there may also be some effect on
12 the intensity of electricity consumption as a result of
13 regulatory effects, which is a topic we've mentioned
14 before?

15 MR. B. CAMPBELL: What kind of regulatory
16 effect are we talking about here? I mean, this is a
17 pretty broad area. Is this open-ended, or is there a
18 particular one you're speaking to?

19 I have no idea.

20 MR. MARK: No, for the present it's
21 open-ended.

22 Q. There's a concept of regulatory
23 effect in the utility business and in economics
24 generally.

25 MR. BURKE: A. Well, I must admit I'm

1 not quite sure what you are referring to for Ontario.
2 There is a general concept that applies maybe in the
3 United States, but here I don't know what you're
4 talking about.

5 I would think that when you first asked
6 the question we concluded you must be referring to
7 standards or something like that that would affect
8 electricity consumption.

9 Q. Well, there is a whole range of
10 things. There are standards, there are things we've
11 mentioned such as the carbon tax or some other such
12 regulation.

13 A. Sure, okay. But are you asking me
14 how those things effected demand in the period 1975 to
15 1990?

16 Q. I'm just asking, firstly, it's clear
17 they do have an effect on intensity or they can have?

18 A. Oh in future, perhaps.

19 Q. Yes.

20 A. Sure.

21 Q. And have you seen an effect in the
22 past?

23 A. Well, my observation would be that
24 for the sorts of specific things you just listed, no,
25 because we haven't had standards for energy use to any

1 degree at all in Ontario until just the last year or
2 so, and I'm not sure what else you might be referring
3 to.

4 Q. Let's take, for example, the ones we
5 have mentioned, things such as the carbon tax. Do you
6 have any assessment of which way that would affect the
7 intensity of electricity use?

8 A. Well, it's a pretty big question. It
9 depends a lot on how carbon taxes are put into place,
10 but if we take it other things equal, the carbon
11 taxes - and by that I mean we don't change the way
12 electricity prices themselves are regulated - then it
13 is fairly evident that given the mix of generation
14 sources in Ontario that any carbon tax would increase
15 the price of oil or natural gas more than it would
16 increase the price of electricity.

17 And as I explained in my direct,
18 depending on how far that goes, you may or may not get
19 into the price range where certain market segments that
20 are essentially, on a pure price basis, not very
21 competitive -- where electricity is not very
22 competitive right now, suddenly finds itself
23 competitive on price.

24 We, as we explained, have been gaining
25 market share for reasons other than price in the past,

1 but on the basis of price, if we were to start to
2 compete in some of these end-uses, we could attract
3 significant increase in demand.

4 And that would be offset only to the
5 extent that the carbon taxes themselves were so
6 traumatic for the economy that they slowed the economy
7 down somewhat.

8 So, it really depends on the scale of the
9 carbon tax, depends on how electricity is priced in an
10 environment in which a carbon tax is imposed..

11 Q. Do I draw --

12 A. I can't give you a clear answer one
13 way or the other.

14 Q. Do I draw from what you are saying if
15 you get a carbon tax or some other constraint on carbon
16 which is uniformly applied--

17 A. Yes.

18 Q. --the best view today is that that
19 will tend to, if anything, would tend to cause fuel
20 switching to electricity?

21 A. No, it depends on how much. As I
22 said, it could be that --

23 Q. It's not going to go the other way?

24 A. Well, let's put it this way. There
25 is a wide range in which we would probably not attract

1 load for fossil fuel price increases, because the gaps
2 that I showed for the residential sector between gas
3 and electricity are, in fact, the narrowest of the
4 three sectors, so there's a lot of room to move there.

5 On the way there can be significant
6 negative income effects. So, it really depends whether
7 the carbon taxes move so far that they get into the
8 price range where people start to find electricity
9 competitive for space heating on a pure price basis or
10 not.

11 Q. I appreciate your caveat about it
12 depends on the price level but, if anything, a carbon
13 tax would suggest that the electricity share might go
14 up rather than the opposite.

15 A. Well, I guess my point was that the
16 share conceivably, although what we've suggested from
17 our results is a negligible effect because the
18 elasticity effect, as we indicated, was zero for the
19 cross-price until you get into that competitive range.

20 Q. I understand that.

21 A. And obviously it wouldn't be a step
22 function. Things would start to ease up as you got
23 closer and closer to a competitive position between gas
24 and oil and electricity.

25 Q. What about a carbon quota as opposed

1 to a carbon tax; would that tend to accelerate the
2 substitution?

3 A. Well, I must say I'm not really
4 familiar with how a carbon quota would work. Could you
5 explain it to me, please?

6 Q. If there was simply a limit placed on
7 emissions as opposed to a tax on them so that one
8 doesn't have the choice of simply incurring the greater
9 cost and still creating the same emissions.

10 MR. B. CAMPBELL: Well, just a minute.
11 Is this a limit placed on everybody, is it restricted
12 to some and not to others?

13 I think the question is so general,
14 because --

15 MR. MARK: If Mr. Campbell would give
16 me --

17 THE CHAIRMAN: Well, let Mr. Mark
18 rephrase it then.

19 MR. MARK: If Mr. Campbell will give me a
20 moment and I will tell the witness, assume, as we did
21 before, that it is of uniform application.

22 Q. Would that not tend to accelerate.
23 If the same constraint is applied to everybody,
24 regardless of industry use, whatever, would that not
25 tend to accelerate the fuel shifting phenomenon?

1 MR. BURKE: A. That is a question I
2 cannot answer and the reason is that applying a carbon
3 tax to Ontario - a carbon quota to Ontario Hydro - it's
4 not clear how we would respond to that and what the
5 cost implications for us would be, and where that would
6 leave our market share.

7 I think you must be assuming somehow that
8 given a carbon quota we would be able to meet increased
9 demand from non-carbon sources, and so somehow the
10 prices would work out that it -- I really don't -- that
11 we increase our market share.

12 Q. Let me suggest two things, and just
13 let me have your thoughts on it. Firstly, you have a
14 mix of generation, the majority of which is not
15 fossil-fueled; correct?

16 A. That's correct at this point.

17 Q. So, if somebody is using a fuel which
18 causes emissions and there is a quota, it may indeed --
19 there will be less emissions associated with a switch
20 to electricity; in comparable terms the energy is going
21 to be less?

22
23
24 ...
25

1 [11:58 a.m.] A. I think I can't really answer your
2 question. I had thought about carbon taxes, I haven't
3 really thought about carbon quotas and how they work.
4 It's not even exactly clear to me yet what your scheme
5 involves. I don't know how to really proceed with it.

6 Q. Certainly to the extent that Hydro
7 would have available to it, let's say, sources of
8 supply which didn't add emissions that are aimed at by
9 the limits, would you not in that scenario expect to
10 see some fuel switching?

11 A. If you are asking me is it possible
12 to arrange something to do with carbon that results in
13 an increase in electricity share, I am sure it is
14 possible.

15 Whether that is likely really is pure
16 speculation. It really depends on exactly how you do
17 it and whether, you know, what the overriding
18 philosophy behind concentrating on carbons is in the
19 first place.

20 Q. Have you considered at all the
21 prospect of electric-powered motor vehicles and the
22 likelihood and the impact of that electro-technology?

23 A. Yes, we have. Dr. Buja-Bijunas can
24 tell you a fair bit about that.

25 Q. Doctor, if I could ask you. You seem

1 prepared.

2 DR. BUJA-BIJUNAS: A. Yes.

3 Q. What are your thoughts on it?

4 A. We actually included the penetration
5 of electric-powered vehicles in the 1990 forecast. Our
6 basic assumptions were that there would be some
7 penetration of electric-powered vehicles, but they
8 would not be taken up by the mass market.

9 There are a number of reasons behind
10 that: They are very expensive; they have a very short
11 range; their kilowatthour/kilometre ratio isn't very
12 good.

13 In coming up with our estimates, we spoke
14 to the Electric Vehicle Society, which exists in
15 Canada. We also spoke to the major battery
16 manufacturer that is looking into the research of
17 producing the batteries for electric vehicles.

18 The net result is an impact on load of
19 less than .3 terawatthours by the year 2015, and that
20 basically comes about by electric fleet vehicles, ie.
21 vans being used by some government bodies and a certain
22 amount of regulation for private fleet vehicles as
23 well.

24 Q. Have you taken into account at all
25 some of the recent events, if you are familiar with

1 them, in California, which I understand suggests there
2 may be a quickening of the arrival of the electric car?

3 A. If you are referring to the L.A.
4 legislations in a thing like that, when we became aware
5 of that formation, we spoke to a number of people like
6 the president of the Electric Vehicle Association.

7 One of the things to consider is that the
8 electric vehicle is not the only alternative to that
9 situation. It is one of many alternatives. You have
10 the methane vehicle, the natural gas vehicle, et
11 cetera. In a lot of cases, these vehicles have
12 advantages in the marketplace to the electric vehicle.

13 In addition to using alternative-fueled
14 vehicles, there is also the option being looked at of
15 turning to mass transit, getting away from using
16 vehicles period on an individual basis inside urban
17 areas, and that might be a more acceptable alternative
18 in some municipal areas as opposed to switching to an
19 electric vehicle.

20 So there are many considerations
21 involved.

22 Q. Mass transit, for one, would tend to
23 increase electricity consumption, would it not?

24 A. On a per person basis, that doesn't
25 appear to be the case; if you are looking on a per

1 person basis.

2 Q. Electricity?

3 A. Sorry, no. It would on an
4 electricity basis, yes.

5 However, what I am referring to is that
6 the difference between that and having everybody
7 sitting in an electric vehicle is somewhat different.

8 Q. No. I appreciate that, but relative
9 to what we have today, switching from combustion
10 engines to mass transit is going to increase
11 electricity consumption.

12 A. Somewhat. But I also have to -- if
13 you look at how much electricity is used in mass
14 transit today, it is an extremely, extremely small
15 percentage of our load.

16 So, even if that were to increase, you
17 are looking at even a substantial increase of a very,
18 very small number.

19 MR. BURKE: A. I believe you have got
20 about a half a terawatthour in the base year for
21 electricity use in transportation, period.

22 Q. On the subject of electricity
23 intensity - and perhaps, Mr. Burke, you can deal with
24 this - I don't know if you were here for the opening
25 statements, but we heard from one of the counsel - I

1 don't quite remember who - the remark that Canadians
2 were relative to most other people, if not all other
3 people in the world, consuming more energy, including
4 electricity, per capita.

5 Are you familiar with figures which show
6 that?

7 A. Yes, I am familiar with figures that
8 show that.

9 Q. And is that something that you at
10 Ontario Hydro have looked at and analyzed?

11 A. There is an interrogatory response on
12 this and the number escapes me, so I will have to give
13 it to you at some point, maybe after lunch.

14 But that interrogatory response includes
15 a quite lengthy notes that explains why it is very
16 difficult to draw inferences from the kinds of data
17 that you are quoting. And there are many factors.

18 For instance, you particularly said
19 energy use in other countries. And the difference
20 between electricity intensities in other countries and
21 energy intensities is not worthy in itself, but to
22 prepare a proper analysis there are so many things that
23 you have to correct for that we actually don't believe
24 it is very fruitful to make those sorts of comparisons
25 at all.

1 What we do think is valuable is to look
2 at technologies in specific and see how technologies
3 that are in use elsewhere in the world compare to
4 technologies available here. Because certainly, if
5 there are more efficient technologies available
6 elsewhere, they could be applied here and we could
7 conceive of efficiency gains in future using those
8 technologies.

9 There is very little that can be inferred
10 directly, especially for the basic load forecast, from
11 such intercountry comparisons.

12 Essentially, the basic load forecast, as
13 we have said -- great. The basic load forecast, as we
14 have said, is a forecast of what is expected to happen.
15 If another country uses energy very differently from
16 the way we use it now, it doesn't mean that we can
17 expect to become like them through the normal evolution
18 of market forces and the natural extension of
19 government policies.

20 What would probably be required is some
21 dramatic change in a variety of factors to bring about
22 a situation where our energy patterns or electricity
23 use patterns changed from the way they are evolving now
24 to the way of some other country which is supposedly
25 doing much better than we are. So, the basic load

1 forecast doesn't capture it.

2 What is interesting about these numbers
3 is what it tells us about efficiency improvement
4 potentials, and that sort of thing is captured in the
5 primary load forecast when we look at the electrical
6 efficiency improvement numbers.

7 The interrogatory that this is provided
8 in is numbered 1.2.2 - yes. It is also in 1.6.15.

9 Q. Right. I haven't had an opportunity
10 to turn them up, but maybe you can tell me briefly:

11 Are there some factors that you can point
12 to which make comparisons difficult?

13 A. Sure. The different price regimes
14 for energy in the different countries, the different
15 climates, the different industrial compositions,
16 different life styles, different regulatory
17 environments; by that, I am now referring to standards
18 that are in place.

19 Q. What about geography and distances?
20 Does that come into play?

21 A. Well, yes. Okay. That is what -- I
22 said "climate," but yes, distances are a factor. Let
23 me see if I can find some. They are laid out here, I
24 think, fairly completely.

25 I didn't mention different income levels.

1 Certainly income levels between countries may make a
2 substantial difference to electricity and energy use;
3 household size.

4 Do you want any more? I really suggest
5 to you this note is a fairly good compendium of the
6 material on this topic and explains why one has to be
7 very cautious in deriving any insight about load growth
8 in Ontario from the experience of other countries.

9 Q. I take it, one of the factors that
10 must be considered is the relative price of electricity
11 in the various countries.

12 A. Certainly.

13 Q. And is it fair to say that Canada,
14 compared to many, if not most, countries has a relative
15 natural price advantage?

16 A. That's correct. Its prices are
17 lower.

18 Q. Okay. And in economic terms, is that
19 something which tends to give our industry in business
20 something of a competitive advantage vis-a-vis the
21 industries of those other countries?

22 A. Other things equal, lower prices for
23 electricity make for lower costs.

24 Q. Mr. Burke, if I could have you,
25 please, turn up briefly Exhibit 9 - that is the

1 90/12/10 load forecast - page 56.

2 Do you have that?

3 A. Yes.

4 Q. You will see in the table in the
5 middle of the page, you have a change in the
6 residential price elasticity just for the price of
7 electricity from minus .78 in your 1989 forecast to
8 minus .51 in your more recent forecast.

9 Can you explain the change?

10 A. The equations are different.

11 THE CHAIRMAN: I am sorry, I am lost.

12 What page are you on?

13 MR. MARK: It is page 56 of --

14 MR. BURKE: A. It is page 55 in the
15 middle of that page.

16 MR. MARK: I am sorry. The copy I have
17 clearly has 5 and 6.

18 THE CHAIRMAN: First of all, are we
19 looking at the same -- it is Exhibit No. 9 I am looking
20 at.

21 MR. BURKE: That is right.

22 MR. MARK: Q. Mr. Burke, I hope I have
23 got the right exhibit number. It is "Load Forecast
24 Report, 90/12/10."

25 MR. BURKE: A. Yes, that's correct.

1 Q. "System demands, December 1990."

2 THE CHAIRMAN: Yes.

3 MR. MARK: Q. I have, on page 56, I have
4 a table called Table 5.1.1, "Estimated Price and Income
5 Elasticities in the Residential Sector."

6 THE CHAIRMAN: Yes.

7 MS. PATTERSON: Yes, that is what I have
8 got.

9 MR. BURKE: You have got it? Okay. I
10 have got it on page 55. That is great. I have got the
11 table.

12 What page --

13 MR. MARK: Q. What page is left out of
14 yours, Mr. Burke? (Laughter)

15 MR. BURKE: A. I don't know.

16 Q. All right. We are dealing with the
17 same table.

18 Are the numbers you have the same as I
19 have? You have a change from minus .78 to minus .51?

20 A. That is correct, yes.

21 Q. All right. Then if you could just
22 start again, please.

23 A. Okay. Well, I think the answer is
24 contained in the paragraph below where it says --
25 sorry, oh, that is for the income effects, right. No.

1 I think I can say nothing other than in
2 reestimating the equation or -- no. I should say two
3 things: Two equations are involved in the residential
4 sector, an an ELUSE and an ELSAT equation that are
5 referred to here.

6 And there are changes in both of those
7 equations, I believe, in the way they are specified
8 since last year. There is the removal of a time trend,
9 I believe, in one equation and -- well, maybe in both.
10 I would have to check to be sure.

11 That actually is the major change, the
12 taking out of time trends in those equations. And for
13 that to have an impact on the price elasticity is not
14 surprising.

15 Q. The models you are referring to,
16 relatively speaking, they are fairly simple ones, are
17 they not?

18 A. The individual equations are, but in
19 fact, we also - you remind me - changed the estimation
20 technique this year. The 1990 residential sector was
21 estimated with three stage least squares as a system, a
22 two-equation system, as opposed to using ordinary least
23 squares for each of the single equations.

24 Q. So, you have really then got a change
25 in the way your model operates as opposed to any change

1 in the assumptions that you are making?

2 A. The theory and the basic data
3 underlying the two equations remains the same, but we
4 have improved the estimation of both of them jointly by
5 including, I believe it is, the ELUSE variable in the
6 ELSAT equation, but I will have to confirm that if that
7 is important; and so creating a simultaneity which has
8 to be resolved by the use of three-stage least squares.

9 Q. Would it be fair to characterize the
10 change we see there as a significant one?

11 A. Well, there is a difference. The
12 price elasticity difference is .27. And as a
13 proportion of the total price elasticity, yes, there is
14 a change of some significance, but it is the result of
15 an approved estimation procedure and I am, therefore,
16 happier with this result than the one I had before.

17 Q. And similarly, just looking at the
18 last row, 'income per household,' you have a change of
19 1.66 reduced to 1.04.

20 A. That is largely the effect of the
21 time trends. The time trends were capturing a negative
22 conservation effect, which, when you take them out,
23 effectively means that the income effect doesn't grow
24 as much -- income doesn't grow as much and -- sorry,
25 the effect of growing income is then not offset by a

1 negative time trend in the future.

2 The net of these is a lower income
3 effect, and I think also there is a spillover to the
4 price effect as well.

5 We, in general, prefer not to forecast
6 with time trends if we can avoid it. So, one of the
7 aims of our modeling has been to eliminate, wherever
8 possible, time trends in the equations.

9 Q. And if I could have you turn then
10 now, Mr. Burke, please, to page 61 of the same exhibit.
11 Let's first see that we have the same page. I am
12 looking at one which has on it table 5.4, the 1990 EEMO
13 Forecast.

14 A. Yes. I have made an adjustment. I
15 am with you.

16 Q. It is still numbered 60 in yours?

17 A. Yes.

18 Q. All right. Anyways, page 61 of the
19 copy the rest of us have. The basic electric energy -
20 that is the column at the right - if you just keep your
21 finger there for a moment, look at that, and now turn
22 at the same time back to page 10 of the same exhibit.

23 A. Is the section 1.7?

24 Q. Yes.

25 A. Okay.

1 Q. I must ask: Do you have it as page 9
2 or page 10?

3 A. We are completely consistent through
4 here. We are one page different.

5 Q. All right. If you look there at the
6 EEMO basic energy demand - that is the column towards
7 the left under EEMO - with the exception of the 165.2
8 terawatthour number for 1995, the other results are
9 different; yet they seem to me from the descriptions
10 that they ought to be the same.

11 A. Sorry. In Section 1.7, as I have it,
12 there are no numbers.

13 Are you talking Table 1.7?

14 Q. Yes.

15 A. Oh, Table 1.7. I think the
16 difference is that between the EEMO forecast and the
17 basic forecast -- yes.

18 I think the difference is associated with
19 the treatment of standards in these numbers, and that
20 would be -- it would be unfortunate if we have an
21 inconsistency, but not material in the sense that the
22 analysis was done correctly.

23 The numbers that are here on table 5.4,
24 as I understand, have already been adjusted for the
25 impact of standards. And it is possible that the

1 numbers associated with EEMO -- I will just check to
2 see whether end-use is in the same situation or not.
3 No. The end-use numbers line up.

4 I have a feeling that you have caught us
5 in an inconsistency, that the EEMO numbers presented in
6 table 1.7 have not taken out the impact of standards;
7 whereas the ones in table 5.4 have.

8 Q. I am sure you can check this over
9 lunch, but would you not expect there would be a
10 difference for the 1995 results as well?

11 A. No. 1995 itself was the last year of
12 the short-term load forecasts.

13 Q. Yes.

14 A. And the short-term load forecast was
15 finalized before we did the long-term forecast. It was
16 only in the long-term forecast that we took standards
17 into account for the first time, in 1990.

18 And so, while your are correct there
19 ought to be some small downward adjustment to 1995 to
20 reflect the impact of standards, it would be small
21 because some of these standards are only taking effect
22 in 1994 for the first time, but anyway, that doesn't
23 show up.

24 ...

1 [12:22 p.m.] Q. Perhaps you could check that when we
2 break for lunch and maybe we can just come back to it.

3 A. Exactly what would you like me to
4 check?

5 Q. I would like to know if your surmise
6 is correct, essentially, and then we will see where we
7 go.

8 A. Okay.

9 Q. You spoke in your evidence-in-chief,
10 Mr. Burke, about the process of moving from a
11 short-term forecast to a long-term forecast. Do I have
12 your evidence correctly that what you do is you use
13 your short-term forecast for 1995 and then you somehow
14 attune your long-term forecast to that departure point?

15 A. Yes. The value in 1995 for load,
16 that is, the result of the short-term load forecast
17 becomes the base year value for the long-term forecast.
18 The econometric model and the end-use model are
19 simulated and from 1989 or 1990 as a starting point,
20 and to the extent that they do not pass through that
21 value in 1995, the short-term -- the numbers for those
22 intervening years, 1990 to '95 are tuned such that both
23 models pass through the same level in 1995 as the end
24 of the short-term load forecast indicates.

25 Q. How do you accomplish that tuning?

1 A. Well, it really is a matter for each
2 of the techniques. In practice, historically, it
3 usually required a fair bit of tuning. By that I mean
4 5 or 10 terawatthours hours, conceivably. But this
5 year, the econometric model was able to just -- its
6 solution passed through that point very closely. So
7 very little tuning was required for the econometric
8 model.

9 The end-use model required tuning, I
10 believe, of the order of 10 terawatthours hours, and
11 that was allocated by sector on the basis of short-term
12 information that -- . The change was made to only the
13 commercial and industrial sectors and was based on some
14 of the indications we were getting from our customers,
15 I believe, when it came to the industrial sector and
16 how that should be going for the period through to '95.

17 Q. So, when you say that you tuned it,
18 do you mean you moved the jumping-off point for your
19 remaining 20-year forecast, in this case, up by the
20 precise number of terawatthours that are increased as a
21 result of the increase in the short-term forecast? You
22 just simply move the slope up on the graph?

23 A. Effectively the starting-off point
24 for the end-use model would have been about 10
25 terawatthours hours higher than it itself would have

1 suggested.

2 Q. And you assume the correctness of the
3 short-term forecast for 1995 and then you in some
4 fashion then go back to your sectoral analysis and
5 allocate that new load over some end-uses?

6 A. Yes, that is correct. And that is a
7 pragmatic solution to a difficult problem.

8 Q. There are some options, as I
9 understand it. Are there other ways you could resolve
10 the difficulty?

11 A. Well, we do need a short-term load
12 forecast that can be updated fairly rapidly that uses
13 up-to-date information for the first few years of the
14 forecast period and yet, can still go out the full five
15 years that are required for production planning. So,
16 we are somewhat constrained in our ability to use these
17 large models.

18 Some of the information that is used for
19 the end-use and the econometric model is only available
20 with a substantial lag in terms of time. To be
21 preparing short-term forecasts with those models is not
22 really feasible and that is why we have adopted the
23 procedure we have, and having decided on a short-term
24 load forecast, we have really very little choice but to
25 stick with it.

1 Q. I think it was perhaps Mr. Rothman
2 who, in his evidence-in-chief, noted the important
3 distinction between the objectives of the long-term and
4 the short-term modelling processes. I am wondering why
5 it is necessary to adjust your long-term model results
6 to conform with a short-term model which does not share
7 some of the important objectives, which are to even out
8 and give you that level or long-term picture.

9 A. The short-term models have similar
10 elasticity properties to EEMO, which probably explains,
11 to some extent, why it is that the EEMO model this year
12 had very little difficulty replicating -- not
13 replicating, but essentially going through the same
14 point that the short-term load forecast went through,
15 although the short-term load forecast is a whole issue
16 in itself. But the intent is that by 1995 we have --
17 or by five years out, typically we have reached a point
18 where the economy is running on a trend and that we, on
19 the long-term path, we are not trying to take cyclical
20 factors into account by the time we get out to 1995.

21 This particular update, this time around,
22 finds us, perhaps, departing from that practice by a
23 little bit, by about the year or two, because we see
24 the downturn right now and can estimate roughly how
25 long it probably will take before we return to a more

1 trend position for growth for GDP, and so where we end
2 up in 1995 now is not where we would expect the
3 long-term forecast to take off from; it's 1997 as we
4 said in our evidence-in-chief. But it is also nearly a
5 year since we produced the 1990 short-term load
6 forecast. So, the five years, six years, essentially,
7 what we are trying to do is by the end of the
8 short-term period, leave the short-term load forecast
9 in a position that is on the long-term trend, that
10 reflects long-term GDP growth rates rather than
11 short-term cyclical fluctuations.

12 Q. And so do you then choose a point in
13 the future to avoid the problem, which I think was
14 alluded to before, of running the risk of starting your
15 forecast at a point which may be at a very high point
16 or very low point in the cycle?

17 A. Exactly, exactly. And we are trying
18 to over -- and five years is usually good enough. I
19 think this time it has taken us six, but to return the
20 load forecast at the end of the short-term period to a
21 balanced point in the cycle, rather than either the
22 trough or the peak of that cycle.

23 It is for similar reasons that we have
24 begun weather-correcting the base year values. We
25 don't want to end up forecasting from an unusually high

1 or low load only associated with extreme weather in the
2 start year. The 1995 year is also, by nature of our
3 forecast, a weather-normalized year. So, we are trying
4 to start off from as balanced a position in terms of
5 weather and economic cycles.

6 Q. In doing your tuning of the long-term
7 to the short-term, is there any tuning of the
8 coefficients or the equations, or do you simply take a
9 different jumping-off point for your basic load?

10 A. The econometric model, I guess you .
11 would be referring to, because the end-use is done
12 differently, is done without changing any of the
13 estimated coefficients. This year it was only, I
14 think, a 10th of a terawatthour or one terawatthour
15 less. It's of that order.

16 Q. The short-term forecast itself, as I
17 understand it, Mr. Burke, is quite a judgmental one; is
18 that fair to say?

19 A. It is more judgmental -- no, I
20 shouldn't say that. No. It's hard to compare
21 judgments.

22 The short-term forecast is spliced
23 together, as we described in our documents, using
24 monthly and annual models, and sometimes the way those
25 models are combined has a fair bit of judgment in them

1 because each model type has a period for which it is
2 most effective. And so we use the monthly models for
3 about the first year to two years and then we tend to
4 switch over to annual models that have, as I mentioned,
5 elasticities that are not too dissimilar from our
6 long-term econometric model to carry us through the
7 remainder of the short-term period.

8 At some point in future, it is
9 conceivable that we might be able to make that break
10 point less than five years into the future, but the
11 reason, as I said, that we use the short-term annual
12 models for - the single equation models - for that
13 early period is because of data problems. We, for
14 instance, do not yet, we have 1990 -- well, we have an
15 estimate of what 1990 GDP for Ontario is and we have
16 several that range widely at this point.

17 But we certainly do not have anything
18 reasonable at all on the mix between our RDP commercial
19 and RDP industrial at this point. It will be quite
20 some time before we actually have that sort of data,
21 and it is for that reason that we cannot run our EEMO
22 model and some of the end-use information comes later
23 still. So, our forecast would be quite out of date, in
24 a sense, if we were to wait for the availability of data
25 required for the larger models in order to make our

1 short-term forecast.

2 Q. Am I correct that, with respect to
3 your latest short-term forecasts for 1995, your basic
4 forecast is at the low end of the range of your model
5 results?

6 A. Which model results are you referring
7 to?

8 Q. My recollection is, and I don't have
9 the exact reference, but you chose the partial
10 adjustment model which my recollection from somewhere
11 was a result lower than the -- sorry, you chose the
12 error correction which was lower than the other models.

13 A. Well, I am not sure what information
14 you have available to you, but if you are looking at
15 the ones that are contained in the 1990 load forecast,
16 those equations were the ones estimated actually last
17 may for the Ontario Energy Board hearings and were used
18 again in July to prepare the short-term load forecast.

19 In order to prepare the update, we have
20 re-estimated those equations and we are using the
21 error-correction equation still. It doesn't look the
22 same.

23 In fact, to royally complicate matters,
24 we did not use 1990 information in preparing our
25 forecasts for '92 and beyond, because we felt that that

1 was going to lead us into the same trap in terms of
2 forecasting that we got into in 1982, because it did
3 not track the extent -- well, we got trapped at the
4 bottom of the recession and forecasted too low
5 thereafter, having scaled the annual models -- well,
6 scaled our forecast down. So, we have made some effort
7 this time to not fall into the same problem of getting
8 overly-influenced by the short-term cycle.

9 Q. Mr. Burke, I want to turn for a
10 little while to the question of uncertainty, which is a
11 subject that you devoted some time to in your
12 evidence-in-chief.

13 Is it fair to say that from a modelling
14 perspective there are three general categories of
15 uncertainty, and they are as follows: input variable
16 uncertainty, model uncertainty and residual
17 uncertainty. Are those the three generally-recognized
18 categories?

19 A. Yes.

20 Q. Input variable uncertainty of course
21 refers to the levels or amounts, the numbers that you
22 ascribe to the variables and put into the model, like
23 GDP, for example?

24 A. I suppose that is a description of
25 uncertainty in GDP.

1 Q. The input variable, I am not
2 concerned with the uncertainty, but the input variable,
3 so we are clear, refers to the value you give to the
4 various variables you need to operate the model?

5 A. I will agree with that.

6 Q. Let me do it this way: To be
7 contrasted with model uncertainty, which is the
8 uncertainty which is associated with the relationships
9 and the coefficients and the elasticities themselves?

10 A. Yes, that's correct.

11 Q. And lastly, residual uncertainty
12 refers to things which you either haven't included in
13 your model, or by their nature you can't include in
14 your model.

15 A. That's a fair description.

16 Q. Weather being one example, and then
17 there being a whole basket of imponderables, political
18 events, et cetera?

19 A. Well, it depends on the model of
20 course. Some models do include weather effects as
21 explanatory variables.

22 Q. But you can't forecast weather.

23 A. Certainly not.

24 Q. Despite the number of people employed
25 in the profession.

1 A. I stay well away from that.

2 Q. We discussed earlier the question of
3 the relative importance of GDP to the electricity
4 consumption. Would you agree with me, Mr. Burke, that
5 uncertainty about GDP is the most important source of
6 uncertainty for your basic load forecast?

7 A. That's what our results show.

8 Q. And would it be fair to say that
9 another important source of uncertainty would be the
10 intensity of electricity use?

11 A. Well, that's what is reflected in the
12 coefficients in those equations.

13 Q. And that is something that would fall
14 in the category of model uncertainty?

15 A. Yes, I guess, in the categorization
16 you have made.

17 Q. And could we also say that, beyond
18 those two, you have other uncertainties, such as price
19 of electricity and other fuels, future load factors,
20 technological developments, et cetera?

21 A. There are numerous uncertainties,
22 there is no doubt about that. However, you have to
23 realize that by estimating an equation that relates
24 load to GDP, many of those uncertainties are also
25 loaded into the relationship that is derived between

1 load and GDP. That is having not included them in the
2 equation, to the extent that they at all relate to or
3 can be correlated with the trends in GDP, they are
4 picked up in the coefficient. So that, for instance,
5 if there is a systematic relationship between some
6 these other variables and the way the economy evolves,
7 that too is picked up by the coefficient standard
8 errors.

24 ...

1 [12:40 p.m.] And then, as I think you're leading me
2 to, there is the residual error itself. I want to make
3 it clear that it's not like these factors don't
4 influence the coefficient errors as well.

5 Q. I understand that, but you have --
6 these relationships, these coefficients that you've
7 taken into account and factored in, we can put those in
8 the category of model uncertainty, and I'm suggesting
9 to you that is something separate and in addition to
10 the uncertainty you have with respect to GDP.

11 A. Yes, that's correct. But, for
12 instance, to the extent that oil prices, for instance,
13 might have affected GDP and intensity, as you put it,
14 they are reflected already in the coefficients
15 parameter estimates. That is, we are more or less
16 certain about those parameter estimates because all of
17 these things have been changing in the past and have
18 altered this aggregate relationship that we're using.

19 Q. You used the example of oil. I had
20 rather thought you had said there was virtually a zero
21 price elasticity for oil.

22 A. Well, okay. I'll use some other
23 variable. You were asking whether all these things
24 were rolled-in. They're rolled-in to the extent that
25 they're there.

1 Q. I'm not sure how far that takes me.

2 A. Okay. I guess what I'm saying is
3 that the relationship between load and GDP is variable
4 for whatever reasons and electricity intensity might
5 sound like a pure concept, but a lot of things have
6 gone into making that result what it is.

7 Electricity price changes will affect the
8 amount of load that we observe with the economy at a
9 certain period of time. And so to the extent that we
10 have variability in that coefficient, it's buried in
11 there.

12 Q. But there is, nonetheless, still
13 uncertainty about the individual elasticities?

14 A. Oh absolutely, absolutely.

15 Q. And those uncertainties are rolled
16 into and are reflected in the intensity which is the
17 product, the uncertainty about the level of intensity?

18 A. You could decompose it that way, yes.
19 We haven't, but...

20 Q. If you could turn with me, please,
21 Mr. Burke, to page 4 of the Exhibit 102. What we have
22 done here, Mr. Burke, is take the uncertainty range for
23 your basic load forecast from the DSP document, and the
24 uncertainty range for your GDP forecast from the
25 forecast which underlies that document, specifically

1 your September, '88 long-term economic outlook.

2 A. Well, that is not correct. The GDP
3 band that you have given here is the one that was given
4 in the prediction ranges, but is not the band that
5 underlies the uncertainty band that was estimated for
6 load.

7 The reason we, in fact, discontinued the
8 prediction range document for the long-term was because
9 it provided a different kind of uncertainty information
10 than the uncertainty information that we required for
11 these bands.

12 Essentially, if I can recollect this
13 distinction, the prediction ranges were designed so
14 that someone could pick any year in the future and
15 start there and know from then forward what remaining
16 uncertainties existed. That is, some planner was
17 interested in, for whatever obscure reason, in starting
18 in 1999 or something like this and knowing what the
19 uncertainty might be in GDP from 1999 on.

20 So that, effectively, the distinction is
21 that the prediction ranges developed then were sort of
22 year over year compounding kind of prediction ranges,
23 and allowed him to start at any point, whereas what we
24 were interested in, and, as is described in Exhibit 10,
25 we were interested in the uncertainty associated with a

1 particular year in the future starting today. Because
2 it really is the compound growth rate from here to that
3 year in the future that matters for planning purposes.
4 The plan itself doesn't really care about the pattern
5 you take to get from here to there.

6 So that it's a different sort of
7 uncertainty that was measured by those prediction
8 ranges and a completely different methodology and in
9 the documentation that explains the 1988 band, it's
10 quite clear that we did not use this prediction range
11 as the basis for the GDP uncertainty in the DSP.

12 Q. All right. Well, let's go to that
13 and let's have a look at it. I've got the September,
14 1988 long-term economic outlook, annual review exhibit.

15 A. I'm just telling you, that wasn't the
16 document used for uncertainty.

17 Q. Well --

18 A. It's the basis for the economic
19 forecast, but it wasn't the basis for the uncertainty
20 in the forecast.

21 Q. Well, I understand that and I want to
22 explore that a little bit, so if you could turn up
23 Exhibit 13.

24 And, in particular, there is an appendix
25 called 'Prediction Ranges Annual Review,' and the

1 easiest way to find it, I'm looking at page No. 9 which
2 will be, oh, about six pages in from the back of the
3 entire exhibit.

4 THE CHAIRMAN: Is that what the 4.0 is,
5 the prediction range instead of the --

6 MR. MARK: Yes, that's correct.

7 Q. And looking at the table 4.0, Mr.
8 Burke, do you have that?

9 MR. BURKE: A. Yes, I do.

10 Q. All right. And looking, for example,
11 at the row for the period 2006 to 2010--

12 A. Yes.

13 Q. --do I interpret this correctly to
14 say that the predicted range for GDP for that period is
15 .9 to 3.8 with an 80 per cent certainty?

16 A. Those are the estimates that are
17 there, yes. We did not use them.

18 THE CHAIRMAN: I think you've made that
19 point. I think you could just answer the questions
20 that you're asked about it.

21 MR. BURKE: Oh.

22 MR. MARK: Q. Now, I know you say you
23 didn't use it for one purpose, but my simple question
24 is: At the time this was made, was this the Economics
25 Division's best estimate of the range for GDP in that

1 period?

2 MR. ROTHMAN: A. As I said yesterday,
3 the reason that we discontinued these prediction ranges
4 is that they weren't --

5 THE CHAIRMAN: But no, no. Please, you
6 can elaborate afterwards, but just answer the question.
7 Was it, at that time, the best estimate; that is what
8 the question was.

9 Do you want to repeat the question, Mr.
10 Mark?

11 MR. MARK: Q. I think Mr. Rothman can
12 answer it.

13 MR. ROTHMAN: A. I heard the question,
14 thank you.

15 It was our analyst's estimate, it was the
16 estimate made by the analyst who did our economic
17 forecast, and it was their best estimate on a
18 subjective basis of the uncertainty that they attached
19 to their forecast of GDP.

20 Q. Well, let's stop for a moment. This
21 is the forecast that was issued by your division with
22 your approval?

23 A. Yes.

24 Q. All right. So it was the best
25 estimate that your division had at the time?

1 A. It was the estimate that we -- it was
2 the best estimate we made for the purpose for which we
3 at that time published this document; that is,
4 especially in this area of probability, one can derive
5 different estimates that are best for different
6 purposes.

7 Q. Let me just stop you there. Was
8 there any other estimate made concurrently with this?

9 MR. BURKE: A. Yes, we made an estimate.

10 Q. Well, for the Economics Division.

11 A. It's part of it.

12 MR. ROTHMAN: A. They're part of the
13 Economics Division.

14 Q. Okay. Mr. Burke, I understand you're
15 going to tell me you made some estimate for the purpose
16 of the load forecast.

17 MR. BURKE: A. As a matter of fact, yes,
18 and we discussed the fact that we would --

19 Q. I just wanted to establish that, and
20 now I want to go back to Mr. Rothman.

21 A. But one minute here, I told you
22 yesterday --

23 Q. Mr. Burke --

24 THE CHAIRMAN: Just a minute, please.

25 MR. B. CAMPBELL: Could he complete his

1 answer, please?

2 THE CHAIRMAN: I think Mr. Mark--

3 MR. MARK: I think he did.

4 THE CHAIRMAN: --Mr. Mark has to first of
5 all complete his question and then we can get the
6 answer.

7 MR. BURKE: You asked me if we had
8 prepared it for the purpose of the load forecast?

9 MR. MARK: Q. Yes.

10 MR. BURKE: A. And my answer is yes, but
11 we also discussed it with the economic forecast people
12 to be sure that we were consistent with them for the
13 purposes for which we were preparing it. It wasn't
14 like we did this and they did that independently, and I
15 think I said that yesterday as well.

16 Q. I'll be fair to you, Mr. Burke, I
17 will come back to you and you will get your chance to
18 deal with what you did with GDP, but I want to deal
19 with Mr. Rothman just for a moment more.

20 And I just want to clarify that the
21 people in your bailiwick, let me call it, the people
22 who deal with the economic forecast, do I have it
23 correctly that this is the forecast that they came up
24 with; there isn't another one in some other economic
25 forecast document?

1 MR. ROTHMAN: A. First, let me say
2 again, the entire division is my bailiwick.

3 Q. Yes.

4 A. But the people in the economic
5 forecast section did come up with this forecast and
6 there is no other published forecast, nor was there
7 another one derived, as far as I know, of an
8 uncertainty for real GDP in Ontario in 1988, long-term
9 uncertainty. We may have had another one for
10 short-term uncertainty.

11 Q. And let's perhaps, Mr. Burke, at this
12 point talk a little bit more then, about some of the
13 procedures you go through.

14 Do you review the various components of
15 the economic forecast as it's produced in this form to
16 determine which of the various components are in some
17 form satisfactory for you to use directly in the load
18 forecasting process?

19 MR. BURKE: A. Yes. When we were
20 developing these bands, which the process for
21 developing them occurred in the year 1988, we were
22 discussing with the economic forecast people the nature
23 of how they got their GDP bands and whether it was
24 appropriate for the use to which we wished to put it,
25 which was to get uncertainty on the compound growth

1 rates between the present and some year in the future
2 and not to care about the path that GDP might take.

3 So, this is a distinction which I guess
4 it's only when you start to work with this that you
5 appreciate that we are making a statement about the
6 uncertainty in the compound growth rate, not in the
7 compounding of annual growth rates.

8 And for the purpose of the prediction
9 range, because they wished to be able to slice it at
10 any start year and to know what remaining uncertainty
11 there might be in future, their methodology led to a
12 wider band than ours.

13 Upon discussion with them, the approach
14 that we took seemed reasonable and, as we developed our
15 methodology, we were in very close touch to see whether
16 they agreed with what we were doing.

17 Q. Mr. Rothman, I take it a projection
18 for the period 2006 to 2010 is one which you would
19 consider a long-term projection?

20 MR. ROTHMAN: A. Yes.

21 Q. And do I understand correctly, from a
22 lot of things you've said to us in the past couple of
23 days, that one of the objectives of long-term
24 forecasting is to indeed eliminate this problem of
25 cyclical interventions and give this nice, levelized,

1 more normalized, if you will, long-term projection?

2 A. Yes.

3 Q. All right. So, when your forecasting
4 people came up with this prediction range, one of the
5 objectives they had in mind was to eliminate already
6 this problem of the volatility?

7 A. Not necessarily. I think that,
8 again, we have to look at what those ranges were used
9 for. On page 3 of that same appendix under Section 2,
10 entitled "Applications," discusses the uses of these
11 probability ranges versus uses of alternative scenarios
12 which were also published in this document at that
13 time, and on page 3, the second paragraph starts:

14 "As a general rule, prediction ranges
15 are appropriate for sensitivity studies
16 relating to a single economic variable or
17 for a random sampling simulation of a
18 group of variables. Where a whole set of
19 variables interacting with each other is
20 required, alternative scenarios are more
21 applicable."

22 What we're talking about here is the use
23 of sensitivity studies where we take a single variable
24 and say what would be the impact on some decision of a
25 value within some probability range around the median

1 forecast. And we would take a sensitivity study that
2 would look presumably at several such values.

3 So, the ranges there, and that's why we
4 gave 50 and 80 per cent points. The ranges there are
5 intended to provide points against which sensitivities
6 can be tested in a given year rather than, as Mr. Burke
7 has suggested, for the uncertainties of compound growth
8 rates.

9 Q. Let me ask you perhaps just one final
10 question on this topic. Assume with me - and I know
11 you may not - but assume with me for the moment that
12 one wants to use a single variable equation relating
13 GDP to load growth, would it then be apt to use the
14 prediction ranges that we see in the table 4.0 to
15 establish the uncertainty?

16 A. That's not what these were intended
17 for. As I've said, these were intended to allow a
18 sensitivity test and why, because of the possibility --

19 Q. The difficulty I'm having, Mr.
20 Rothman, is this a probability statement about the
21 future or not?

22 A. Yes, it's clearly a probability
23 statement about the future.

24 MR. MARK: Mr. Chairman, perhaps it's a
25 good point to break. I frankly want to contemplate

this just a little bit.

THE CHAIRMAN: All right. We will adjourn until 2:30.

THE REGISTRAR: The hearing will adjourn
until 2:30.

---Luncheon recess at 1:00 p.m.

...

1 ---On resuming at 2:32 p.m.

2 THE REGISTRAR: This hearing is now
3 resumed. Please be seated.

4 THE CHAIRMAN: Mr. Mark?

5 MR. CAMPBELL: Just before Mr. Mark
6 continues, there was a matter that the witnesses were
7 asked to check over lunch; it had to do with whether
8 there was a difference in standards and it was going to
9 be confirmed. And I believe they have an answer to
10 that and perhaps we could deal with that and get it off
11 my list.

12 MR. BURKE: Yes. In Exhibit 77, which is
13 the 1990 econometric load forecast, there are tables 1
14 and 2, 1.1 and 1.2, which lay out the econometric model
15 forecast; and then the adjustment to the model forecast
16 for standards which constitutes the basic load
17 forecast.

18 And the numbers which were in Chapter 5
19 of the load forecast report include the standards and I
20 believe the numbers on page 10 did not include the
21 standards and that probably was an error. They should
22 have been the same numbers as in Chapter 5; that is, in
23 both cases, the standards are subtracted from the EEMO
24 projection in order to -- the impact of standards is
25 subtracted from the EEMO projection in order to get the

1 basic load forecast that the econometric approach
2 produces.

3 MR. MARK: Q. Now, we noticed before,
4 Mr. Burke, that there was one year where the figures
5 were the same. Does that imply there was no adjustment
6 to be made for that year?

7 MR. BURKE: A. As I explained in this
8 morning, in 1985 - that was the last year of the
9 short-term load forecast - and yes, the forecast was
10 complete before the consideration of the impact of
11 standards that was brought into the long-term forecast
12 was made.

13 That is, the short-term load forecast
14 numbers were finalized in July of 1990 and we
15 incorporated standards into the long-term load
16 forecasts over the fall of 1990 and we did not then go
17 back and revise the 1995 value for the short-term load
18 forecast to reflect the impact of standards. I can
19 assure you it would be a small amount for that year.

20 Q. Would it be on an order of magnitude
21 comparable to the 1990 adjustment or something smaller?

22 A. There are several places in this
23 document that show the impact of standards. Yes, the
24 numbers are given in table - at least for megawatts -
25 in Table 1.4.1, which would be -- they are, I guess, on

1 page 7 of your --

2 Q. Page 6 of mine.

3 A. Oh, good, page 6.

4 Q. To be clear for the record, it is
5 labelled, "Table 1.4.1, the impact of standards on
6 efficiency improvement."

7 THE CHAIRMAN: Remind me of the exhibit
8 number of this one.

9 MR. MARK: I hope we are looking at
10 Exhibit 9.

11 MR. BURKE: That's correct. And what it
12 shows is the impact on the basic load forecast of
13 standards is 88 megawatts.

14 To get the energy values for that, one
15 would have to go to tables in the end-use section. The
16 residential numbers are given in table 4.1.5.

17 DR. BUJA-BIJUNAS: For the impact of
18 standards for the commercial sector, they are in
19 Exhibit 17, Table 16 and 17; however, those are only --
20 excuse me -- Table 18 -- impact of standards on a
21 year-by-year basis from 1989 to 2015 for the commercial
22 sector.

23 MR. MARK: Q. Okay.

24 MR. BURKE: A. So, if you take the
25 annual values from Table 4.1.5 of Exhibit 9 - that is

1 the residential impact in energy terms of the
2 standards - I think you can get a value - you will have
3 to interpolate slightly for '95, because the model
4 works in even-numbered years.

5 But anyway, you can find your energy
6 value for '95 and there is an energy value for
7 commercial that Dr. Buja-Bijunas has just given you
8 from the...

9 DR. BUJA-BIJUNAS: A. It is about 800
10 gigawatt hours, is the impact of standards in 1995.

11 Q. So, we are looking at an
12 adjustment -- is that the total for the two sectors
13 roughly?

14 MR. BURKE: A. The total energy would be
15 about 500 gigawatthours for 1995 corresponding to 88
16 megawatts in the table.

17 We did not revise the short-term load
18 forecast value for 1995 down subsequently. That is
19 something we might do next time around.

20 Q. Yes. I just want to be clear. You
21 would do that and then the figure would be consistent
22 methodologically with the years prior and afterwards?

23 A. No. No standards are subtracted
24 prior to 1995.

25 Q. All right.

1 A. It is only from 1996 on, in the
2 long-term forecast, that we have the impact of
3 standards reflected.

4 Q. And the adjustment, in any event,
5 according to the numbers you have given would be about
6 .5 of a terawatthour?

7 A. That's correct.

8 Q. Mr. Rothman, if we could go back,
9 please, to the subject we were discussing before the
10 recess, which, you will recall, was the prediction
11 ranges for GDP which appear on page 9 of the appendix
12 to the September '88 long-term economic outlook,
13 Exhibit 13.

14 MR. ROTHMAN: A. Yes?

15 Q. All right. Dealing with that table
16 again, Mr. Rothman, could you tell me: Is this a
17 marginal or joint probability statement?

18 A. It is a marginal statement.

19 THE CHAIRMAN: Marginal what? I am
20 sorry, I didn't get the other word.

21 MR. MARK: Q. I want to know whether
22 there was a marginal probability statement for each
23 period or a joint probability statement.

24 MR. ROTHMAN: A. It is marginal and it
25 is important to remember that it is marginal for each

1 period.

2 Q. Yes.

3 A. That these are not cumulative
4 probabilities. These are not probabilities of a
5 long-term growth rate, which is a major reason for the
6 difference between them and the difference in their
7 usefulness between these and those used for the load
8 forecast on certainty bands.

9 Q. All right.

10 A. But if we look at the appendix, to
11 this appendix, which is unnumbered, but starts -
12 actually, it is numbered A1 through A4 - and starts
13 after page 20 of the appendix that you are looking at,
14 there is an explanatory note on probability which
15 clarifies that these are marginal probabilities.

16 Q. But they are marginal for that
17 variable taking out all other variables?

18 A. Well, that is the definition of a
19 marginal probability.

20 Q. And then to try to put it in layman's
21 terms or, at least, in terms that I can understand,
22 looking, for example, to the period 2006 to 2010, what
23 this tries to tell you is what the range is for that
24 period of years without trying to tell you what the
25 cumulative effect is.

1 A. Right. If we look at what is there
2 for the period 2006 to 2010, there is a statement there
3 with an 80 per cent -- the bottom of the 80 per cent
4 range is .9 per cent; the top of it is 3.8 per cent.

5 The statement that is made there is that
6 there is an 80 per cent probability that the compound
7 five-year growth rate in those five years will lie
8 between .9 and 3.8 per cent. There is no statement
9 here about where that has come from, nor where it is
10 going. So, these probabilities are intended to be path
11 independent.

12 That means that there is -- another way
13 of saying path independent, a technical way of saying
14 path independent is that they are a random walk. It
15 doesn't matter where you have been; at what point you
16 are starting from. The chances of going in a positive
17 or negative direction remain the same. Whether you are
18 above the median forecast or below it.

19 That is not the way we want to forecast
20 for the load forecast uncertainty bands.

21 Q. Excuse me, can I just -- I will get
22 shortly to what you do differently for the load
23 forecast purposes; if I could just stay with this just
24 for a moment. For what purposes would the corporation
25 use the marginal probability statement?

1 A. In fact, as far as we can remember,
2 nobody used these probability statements for the GDP.
3 That is one of the reasons that they were discontinued.
4 This is the last issue of the prediction ranges.

5 The prediction ranges that were used, I
6 believe, were some of the prediction ranges on the
7 financial markets' variables.

8 The finance people, the treasury division
9 wanted to be able to run some sensitivity tests around
10 the viability of different financing strategies
11 depending on the distribution of, the probabilities of
12 various levels of interest rates in the future.
13 And I believe that they used at one time these
14 prediction ranges to run sensitivity tests against
15 which they tested their financing strategies.

16 But they didn't need GDP prediction
17 ranges to test their financing strategies. They needed
18 the financial market variables and that is why we
19 discontinued this. We still, as I said earlier,
20 provide them with alternative scenarios against which
21 they can test their financing strategies.

22 Q. And just to keep with the example you
23 cited of the finance people, I would think that it is
24 not terribly useful for them to have this type of
25 probability statement because they can't possibly want

1 to ignore the intervening events. It really does them
2 no good; is that fair?

3 A. As I just said, we have discontinued
4 this publication. We have discontinued these
5 prediction ranges. We now provide them with
6 alternative scenarios which are statements of a path,
7 and we give them several paths against which they can
8 test their financing strategy.

9 Q. Do you, Mr. Rothman, now produce, as
10 part of your load forecasts, a joint or a cumulative
11 probability statement of GDP?

12 A. The load forecasts' department and
13 the economic forecasts' section have worked together to
14 develop the GDP model that will produce the GDP
15 uncertainty for use in the load forecast. And the
16 division, those two units together, produce that
17 uncertainty band.

18 Q. Can you now tell us, either Mr.
19 Rothman or Mr. Burke, what the probability range for
20 GDP is on the chart that I now have up which is page 4
21 of Exhibit 102?

22 You see where it says GDP, and I have a
23 range of 1.1 per cent to 4.0 per cent.

24 Can you tell me what the range is that
25 you used for the purpose of making the load forecast;

1 that is, the 1988 load forecast that underlies the DSP
2 Report?

3 MR. BURKE: A. The uncertainty band for
4 GDP that was used to produce the 1988 load forecast
5 confidence band is given on page 11 of Exhibit 10.
6 That is in table 5.2.

7 And the numbers for the growth rate from
8 '87 to 2010 is a range at the ten per cent point of 1.7
9 per cent per annum on average through to 3.5 per cent
10 for the upper 90 per cent.

11 Q. So, for purposes of consistency, I
12 would be correct to substitute 1.7 for the 1.1 that I
13 have and substitute, you say, 3.5 per cent for the 4.0
14 per cent?

15 A. That's correct.

16 Q. I just want to stay with this concept
17 we have been dealing with for a few minutes longer if I
18 might.

19 As I understand what you said in your
20 evidence in-chief, is that you feel you are more
21 certain about what the long-term average is going to be
22 then you are about what the range is going to be in any
23 intervening portion; is that what --

24 A. No. I made it clear that the range
25 in absolute dollars is always increasing.

1 Q. Yes.

2 A. The growth rates, by compounding them
3 over a longer and longer time period, tend to average
4 down and can move closer to the median, so maybe --
5 just not average on -- they converge toward the median
6 just in part because of the fact that they are being
7 compounded over such a long period.

8 So, that small changes in a 25-year
9 growth rate are worth much more in terms of absolute
10 dollars than changes in a two-year growth rate. But
11 they are relative to the median growth rate, yes.

12 We definitely perceive much more
13 uncertainty in the early years - that is, the growth
14 rates could be much more different in the early years
15 of a forecast than we would expect them to be on
16 average over 25 years of the forecast.

17 Q. And as you have said, and do I have
18 it correctly, the absolute certainty range will still
19 be growing?

20 A. I believe that is the case, yes.

21 Q. And does the same reasoning apply to
22 both GDP and the load growth?

23 A. Yes.

24 Maybe it would be helpful if I pointed
25 out that if we use the sort of range of growth points,

1 like a half to 4 per cent or 4-1/2 per cent that we
2 have for the first five years of the forecast, if we
3 extended that for 25 years - if you had magnitudes that
4 wide apart - we would be finding ourselves in a
5 situation where we would actually be claiming that the
6 Ontario economy would stagnate within an 80 per cent
7 confidence.

8 We can actually stagnate for 25 years at
9 .5 per cent growth, an event which has never happened
10 in Ontario. Nothing close to that has ever happened.
11 It is quite unreasonable to extend the sorts of ranges
12 that are conceivable in the short term over a long-term
13 period.

14 Q. Your analysis then, I take it,
15 assumes that there is something independently
16 predictable about roughly where your long-term average
17 is going to be.

18 A. The median growth is determined as we
19 have described it. The history essentially speaks for
20 itself in terms of the fact that compounding growth
21 rates over longer and longer periods tends to reduce
22 the variability in - or the standard error of - a
23 growth rate.

24 ...
25

1 [2:37 p.m.] MR. ROTHMAN: A. The question of
2 predictability comes back, at least partly back, to the
3 question of the predictability of GDP, and that's
4 really a topic that we have covered already,
5 essentially saying that we believe that it is
6 reasonable and more accurate in the long run to
7 forecast that GDP will stay reasonably close to a track
8 of its potential growth rate. That it means that we
9 have to be able to find -- its potential growth rate
10 isn't essentially forecastable and we don't think
11 that's a trivial problem by any means, but I don't
12 think it's unforecastable.

13 So instead of thinking that, as Mr. Burke
14 suggested, that we could have some potential path and
15 the economy could deviate indefinitely from that path,
16 leaving a very difficult forecasting problem, we have
17 concluded that the economy is unlikely to deviate for
18 very long periods very far from its potential growth
19 path. And as Mr. Burke points out, in fact,
20 historically it hasn't. So that gives us some could
21 comfort, some reason to believe that it is reasonable
22 to approach the forecasting problem from that
23 viewpoint.

24 Q. Let's look at the historical then,
25 Mr. Rothman. Is there a historical period you point to

1 as giving you some comfort for where your forecast ends
2 up in terms of long-term GDP growth rate?

3 A. Yes. If we look at the last 25 years
4 as an example for our forecast of productivity growth,
5 the last 25 years' average productivity growth in
6 Ontario was about 1.3 per cent, that includes a decade
7 of extraordinarily low growth that was followed by a
8 decade of higher growth, but we believe
9 extraordinarily-reduced, though in a minor way, that
10 period. So, our forecast of long-term productivity
11 growth is for somewhat higher growth than occurred over
12 that 25-year period.

13 Our forecast of 25-year productivity
14 growth is 1.6 per cent per year as opposed to that
15 25-year history of 1.3 per cent per year. And I think
16 we have looked also at what might be affecting
17 productivity growth in that future period and
18 suggesting that in terms of output per worker, there
19 are good reasons to expect it to accelerate towards the
20 end of the period rather than to decline.

21 Q. And is the predictability of load
22 growth much less certain than the predictability of GDP
23 growth?

24 MR. BURKE: A. Well, the GDP bands -- I
25 guess the way it works out, the difference really comes

1 down to what additional uncertainty is contributed by
2 the variations in the coefficients and in the error
3 term, and that tend, as I recall, to add about .2 or .3
4 per cent to the compound growth rate.

5 That is, if all we did was simulate GDP
6 and translate that into load uncertainty versus
7 simulating the whole equation with the coefficients and
8 the error term, the difference in the compound growth
9 rates is about .3 per cent over the 25-year period.

10 So, I think results like that are
11 actually given in one of the reports that was filed in
12 response to Interrogatory 1.9.50, and actually you have
13 got it on one of yours as well. In fact, it's in the
14 package you have sent out. It is in the package before
15 the Board today. Yes, 1.9.50, and it shows in an
16 earlier version of this a sort of a stepping up of the
17 impact of including more and more of the elements of
18 the uncertainty into the uncertainty band.

19 Q. Can I try and distil something from
20 all of that, Mr. Burke. Is it fair to say that your
21 uncertainty with respect to load growth should be
22 somewhat larger than your uncertainty with respect to
23 GDP alone?

24 A. Yes.

25 Q. Let's go back, please, and look at

1 our revised chart No. 4, okay?

2 A. Okay. What you are looking at --

3 Q. If I may, just for the record, Mr.

4 Burke, as I read this, even with your adjusted figures,
5 we see a GDP uncertainty range of 2.1 per cent and we
6 see, nonetheless, a basic load growth uncertainty range
7 of only half that, something less than half that 1.0
8 per cent.

9 THE CHAIRMAN: I think you mean 2.8 per
10 cent.

11 MR. MARK: Revising the figures --

12 THE CHAIRMAN: My figures are 1.7, 2.6,
13 3.5.

14 MR. MARK: Then you are looking at 1.5,
15 pardon me.

16 THE CHAIRMAN: Your range is from 3.5 to
17 1.7.

18 MR. MARK: Yes.

19 Q. So you have a range for GDP of 1.8,
20 but you only have a range for basic load of 1.0.

21 MR. BURKE: A. Yes.

22 You are looking at the band for 1988?

23 Q. Yes.

24 A. And Exhibit 10 is all about what we
25 did to the band between 1988 and today.

1 Q. I appreciate that, but let's stay
2 with 1988.

3 A. Well, if you insist.

4 Q. Well, I do. That's the forecast
5 Ontario Hydro had underlying the plan that was
6 submitted to this Board.

7 A. Yes.

8 Q. And notwithstanding what you have
9 told us about what should be the relationship between
10 the uncertainty range for GDP and the uncertainty range
11 for load growth, your numbers show that you had a
12 substantially smaller uncertainty range for load growth
13 than you did for GDP at the time you published your
14 forecast; am I correct?

15 A. Yes, you are correct. But I should
16 point out to you that the equation has -- yes, you are
17 correct, but there are reasons.

18 Q. It must have been apparent to you at
19 the time that that was, at least intuitively,
20 suspicious?

21 A. Well, it is the natural result of
22 that equation which has two terms in it, the GDP term
23 and the a term in GDP squared with a negative
24 coefficient on the second term. And so, in fact, what
25 is going on is that, over time, the equation, by its

1 nature, is also one the factors that contributes to
2 bringing in the band over time. And if we had simply
3 had GDP in the equation, we would have gotten a
4 different band, and your direct relationship with that
5 GDP uncertainty should relate directly to load
6 uncertainty would hold, but the equation, in fact, is
7 estimated as a negative term for GDP squared. We are
8 applying the equation because, without putting in that
9 second term, we would not get a good fit between the
10 load forecast itself and the forecast produced by this
11 for the purposes of deriving the uncertainty band.

12 Q. Let me try and get it down to a
13 somewhat simpler level. My question, I guess, is
14 simply is, do you consider that the comparison of the
15 range, or the uncertainty ranges of basic load and GDP
16 underlying the 1988 forecast, are plausible or
17 implausible?

18 A. We thought they needed to be changed
19 and we did change them in the 1989 approach. And
20 effectively, the GDP uncertainty did not change but the
21 load uncertainty was increased for the long-term.

22 Q. You can do it one of two ways to get
23 the same result, all right.

24 Let's move ahead to 1990 then, if we can,
25 if we could just turn to the next chart, No. 5.

1 Just before we get to this, Mr. Burke,
2 the theory that you have been talking about dealing
3 with the uncertainty into the future, I take it that is
4 something that you developed in consultation with Mr.
5 Rothman and the other people at Ontario Hydro, is it?

6 A. Certainly.

7 Q. And since you have applied that
8 theory to your load forecast work, have you reviewed
9 the theory and the application of it with experts in
10 the field outside of the corporation? I am talking
11 about your uncertainty modelling that we have been
12 speaking about.

13 A. We have not explicitly sent the
14 approach for review to external bodies. I think there
15 have been papers given at one or two places by people
16 involved in developing the methodology.

17 Q. Those are Hydro people?

18 A. Yes, Hydro people.

19 Q. Okay. Let's now turn to chart No. 5.
20 Are my numbers right this time in that do I have the
21 correct uncertainty range from your 1990 forecast for
22 the year 2010 with respect to both basic load growth
23 and GDP growth?

24 A. Sorry. On page 11 have you
25 calculated these yourself from the 1990 values? The

1 growth rate that's given for basic load for '89 to 2010
2 is 1.4 per cent there.

3 Q. You are talking then about the
4 uncertainty range for basic load growth, for this
5 period should be a 1.4 per cent range?

6 A. Yes, that's what's on page 11 of
7 Exhibit 9.

8 Q. Let's bear that in mind for a moment.
9 Let's look at the GDP.

10 A. Were you starting in '89 or '90?

11 Q. 1990.

12 A. So you started from the first year of
13 the actual, is that what you were starting from?

14 Q. Just taking the figures from page 11
15 and from and including 139.4 to and including 188.3.

16 A. I'm not quite sure. You should be
17 starting from the actual for 1989, the 140.9 at the...

18 Q. If you will just give me a moment.

19 Using those numbers, the numbers you say
20 we should use, you get a range of 1.4 per cent?

21 A. Well, the lower bound is 1.4, yes.

22 Q. Yes. And the upper bound?

23 A. 3.3.

24 Q. So then just for simplicity's sake,
25 if we accept your numbers today then on chart 5, for

1 basic load we will change 1.5 to 1.4, and then the
2 range will be 1.9; correct?

3 A. Yes, that's correct.

4 Q. And GDP, do I have those numbers
5 correctly?

6 A. I think that really corresponds '89
7 to 2010 as well. Let me just confirm that. Yes, that
8 is the '89 to 2010.

9 Q. So in your 1990 -- I have those
10 numbers correct?

11 A. Yes, as long as we understand that we
12 started in 1989.

13 Q. But we are now comparing apples to
14 apples?

15 A. That's right.

16 Q. So, in your 1990 forecast then, you
17 still have a larger uncertainty range for GDP than you
18 do for basic load growth?

19 A. Yes, it would appear so.

20 Q. Does that cause you any concern, Mr.
21 Burke?

22 A. Well, it's the result of our
23 methodology. In being consistent in its application,
24 this is the result. I think they are very close and
25 one might intuitively feel that there should be a wider

1 band for the load growth than the GDP growth, but the
2 nature of this equation is such that in tracking our
3 load forecast, it also implies a convergence in the
4 uncertainty. That is an element of why the bands
5 narrow, as well as the results that we talked about for
6 GDP and population growth rates in the long-term.

7 Q. Am I correct though, Mr. Burke, that
8 if forecasting the load growth is inherently more
9 uncertain than forecasting the GDP growth, that the
10 range must be wider for the former than the latter? If
11 you can't answer, Mr. Burke, that is fine.

12 A. Well, I think on the face of what you
13 are saying, I cannot think of a good reason at this
14 point other than the things that I have told you, that
15 we feel that the methodology we used was an appropriate
16 way of going about this.

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22 ...
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1 [3:15 p.m.] Q. That's not an answer to my question,
2 Mr. Burke, and maybe answer it or say you can't answer.

3 A. Well, it sort of begged the question
4 by saying that, inherently if GDP is more uncertain
5 than -- sorry, load is more uncertain than GDP,
6 shouldn't one thing be the other.

7 Q. I thought we had established the
8 premise some few moments ago. I thought we had agreed
9 that there's more uncertainty associated with the
10 prediction of load growth than there is with GDP
11 growth.

12 That's correct?

13 A. I guess what we're saying is the
14 results don't show that.

15 Q. I know the results don't show that,
16 that's apparent.

17 A. Yes, yes.

18 Q. But you agreed with that statement a
19 few moments ago. Do you want to stay with that answer?

20 A. Okay, I'll stay with that answer.

21 Q. All right. Now, considering that --

22 A. There's nothing really more to say
23 then.

24 Q. So then the answer is yes?

25 A. Yes.

1 Q. Just to put this discussion in some
2 perspective, Mr. Burke, can we get some idea of the
3 effect of a .1 per cent change in the median forecast
4 of load growth over the next 25 years on peak demand?

5 Is that a figure you could give us
6 readily?

7 A. Well, it depends on -- you know, the
8 impact depends on the base growth rate. This is an
9 exponential effect, so that the value you get for 2.3
10 is going to be different than the value you get by
11 incrementing 3.3 to 3.4.

12 Q. Maybe even in rough terms, if we were
13 to go from an average annual growth rate of, say, 2.3
14 to 2.4 per cent, what's the order of magnitude of the
15 difference in your peak load at the end of the period?

16 A. It would make a difference. This is
17 my calculation here. It would make a difference of
18 2-1/2 per cent.

19 Q. Can you give us that in megawatts?

20 A. Well, for the year 2015 basic peak of
21 43.3 gigawatts, I'd say about a thousand megawatts in
22 the year 2015.

23 Q. Changing topics a little bit, Mr.
24 Burke, I want to turn -- I guess while we're on the
25 subject of capacity and megawatts, I want to turn to

1 the subject of peak, if I could.

2 Let me ask you this: Does Ontario Hydro
3 plan to meet energy or peak?

4 A. Strictly speaking I don't think I can
5 claim to answer that. Certainly I know both are
6 important at different times for different purposes and
7 I couldn't say whether one is more important than the
8 other.

9 Q. You or your department are,
10 nonetheless, the people who are responsible for
11 forecasting both future energy and peak?

12 A. That's correct.

13 Q. And what you're telling me is that, I
14 take it, you're not sure whether the object of this
15 planning exercise we are engaged in is to meet energy
16 or peak?

17 A. Or whether there's necessarily a
18 difference past a certain point in time between, which
19 you're looking at.

20 Q. But you're not sure which it is?

21 A. I am not sure, no.

22 Q. And as I understand it, you have, in
23 fact, determined that you either can't or need not
24 forecast peak over the planning period we're dealing
25 with; is that correct?

1 A. We do prepare a forecast of peak over
2 the planning period.

3 Q. Perhaps I've used a poor choice of
4 words. You give a forecast but, as I understand it,
5 you say it's essentially unpredictable and you're
6 assuming a static load factor; are you not?

7 A. I don't think we said it was
8 unpredictable, we said that the experience of the last
9 20 years did not give a clear trend to the load factor
10 and we have held the load factor constant for the
11 purpose of the forecast beyond 1995.

12 Q. The system load factor will have an
13 effect upon energy; will it not?

14 A. We forecast energy to begin with.

15 Q. Yes.

16 A. And all our models and all our
17 analysis is related to energy, so the purpose of the
18 load factor is to then translate that energy into peak.

19 Q. You assume a certain load factor and
20 you translate energy into peak; is that the exercise?

21 A. That's correct, yes.

22 Q. All right. Is it not also true
23 though that what your load factor is may in turn affect
24 the amount of energy?

25 A. Well, I really don't follow you. In

1 preparing the forecast we start with energy, it doesn't
2 feed back to energy.

3 Q. When you're doing your modeling of
4 energy use into the future - and if I am incorrect
5 please tell me - but I would have thought that the
6 assumption about the load factor that your customers in
7 aggregate will place on the system, has some bearing on
8 the amount of energy that they will consume in
9 aggregate?

10 A. Well, as we described, the way we go
11 about preparing the load forecast is looking at the
12 energy patterns, the energy consumption patterns either
13 econometrically or on an end-use basis, and you're
14 saying an energy forecast, and what happens from the
15 customer perspective is hopefully already captured by
16 that energy forecast. We're slicing it different ways.

17 Q. All right, fair enough. In any
18 event, going back to the point we had a few moments
19 ago, your forecast of capacity required will very much
20 be a factor of your projection of the load factor?

21 A. Yes.

22 Q. And if we could turn to page 10 of
23 the package, it's the very last page of the package in
24 Exhibit 102.

25 You'll see there, Mr. Burke, that the

1 column basic peak in megawatts and basic energy in
2 gigawatthours, and load factor, those three columns,
3 you'll recognize those as being taken from your
4 forecast?

5 A. Yes.

6 Q. And what has been done here, Mr.
7 Burke, is if we take, in the next column, an assumption
8 of a load factor remaining constant at .676 rather than
9 decreasing, as you project it will, you get a differing
10 basic peak. Do the mathematics seem correct to you?

11 A. Yes.

12 Q. While you have been unable to discern
13 any trend from the past figures with respect to load
14 factor, have you made any attempt to forecast it beyond
15 1995 or, in light of the absence of a trend, have you
16 simply made an assumption of constancy after 1995?

17 A. Effectively we have made an
18 assumption that the experience of the 20 years, from
19 the early 70s through to present, is indicative of what
20 to expect for load factors in future and, yes, we have
21 assumed zero change in the load factor after we've
22 taken into account the information that is derived
23 through analysis of the customers' trends in load
24 factor for the first five years for which we do that
25 analysis.

1 Q. Why do you see the load factor
2 declining over the first five years?

3 A. Well, as I explained, we look
4 individually at each and every customer and apply
5 various forms of trend analysis to their load factors
6 and the composition of customer classes changes --
7 sorry, yes, essentially the composition of loads of
8 different load factors; in other words, each individual
9 customer grows at different rates over this five-year
10 period. So that the load factor mix that starts in
11 1990 may, without any change in individual customers'
12 load factors, evolve just because, say, industrial
13 customers with higher load factors grow faster or
14 slower than other customer classes, and I do not have a
15 break out exactly of which customers' load factors were
16 rising and falling, but this is the result of that
17 analysis of essentially the 500 or so customers that
18 Hydro sells to. So, it's a large number of small
19 changes.

20 Q. When you derive your forecast of
21 peak, which you take from your energy by applying the
22 load factor, do you ascribe any separate uncertainty to
23 your forecast of peak to reflect any uncertainty you
24 may have in your forecast of load factor?

25 A. Again, this is one of those things

1 where one would expect that there should be more
2 uncertainty in the peak forecast than the energy
3 forecast.

4 Q. Yes.

5 A. And in various interrogatory
6 responses, at least one anyway that I will pull out,
7 but anyway, we have said that there are some analysis
8 that we would like still to do in order to be able to
9 better handle the relationship between peak uncertainty
10 and energy uncertainty.

11 There are some practical problems in
12 simulating peak and energy uncertainty, it's not -- we
13 have -- we don't translate one for one, effectively, as
14 we're doing now, we end up with a situation that we may
15 have a peak uncertainty that doesn't necessarily line
16 up with the energy uncertainty. That is, points on the
17 peak distribution may not necessarily correspond to the
18 same point on the energy distribution. They are just
19 the two distributions, energy distribution and peak
20 distribution, separated by the simulation of the load
21 factor itself and its uncertainties, and I think
22 pragmatically that would create problems for planning
23 purposes.

24 But there is a second factor which we
25 have not been able to address, and that is, a large

1 part of the load factor uncertainty is associated with
2 the fact that we're using raw data here for peak, not
3 weather corrected peak data historically. And that is
4 a large part of the variability that is observed,
5 historically, in the peak data and in the peak load
6 factor.

24 ...

1 [3:29 p.m.] Peak uncertainty due to weather is much
2 higher than energy uncertainty due to weather.

3 Our forecast is a weather-normal forecast
4 and, therefore, the uncertainty due to weather is not
5 something that is captured in the load forecast but is
6 something that the planners take into account when they
7 are planning for a liability. They have certain
8 considerations about weather uncertainties that they
9 should be planning for.

10 And so, we have not constructed that
11 weather-corrected peak data set yet, unfortunately, and
12 so, we would expect, though, when we look at that to
13 see much less variability in weather-corrected load
14 factors, historically, than we do observe in just
15 looking at the raw data. And so, the incremental
16 uncertainty effect is not clear. I don't know how much
17 difference it would really make between the approach
18 that we are using and an approach that was based on
19 weather-corrected peak information.

20 But I would think it is relatively small
21 because the correlation between weather-corrected peak
22 and weather-corrected energy for the period that we
23 have it is very high indeed. Some of that data was
24 also submitted in an interrogatory response, but we
25 have that data for the last eight years.

1 Q. At at some point, you hope to be able
2 to get a better handle on that uncertainty. As of now,
3 you can't and you don't give any estimate of it.

4 A. That is correct.

5 MR. MARK: Mr. Chairman, I am about to
6 turn to a new area.

7 THE CHAIRMAN: We will take the afternoon
8 break then, 15 minutes.

9 THE REGISTRAR: We will recess for 15
10 minutes.

11 ---Recess at 3:32 p.m.

12 ---On resuming at 3:47 p.m.

13 THE REGISTRAR: Please come to order.
14 The hearing is again in session. Please be seated.

15 THE CHAIRMAN: Mr. Mark?

16 MR. MARK: Thank you, Mr. Chairman.

17 Q. Mr. Burke, we spoke a few moments ago
18 about one aspect of the relationship between your
19 department and the system planners. I want to deal
20 with that just a little bit more if I might.

21 Do the system planners discuss with you
22 what they consider to be the key risks to the forecast
23 for their purposes?

24 MR. BURKE: A. No.

25 Q. Do you know whether the system

1 planners do any sort of penalty method analysis to
2 determine where the risks to the corporation are
3 greater vis-a-vis variations in the forecast in the
4 future?

5 A. I really can't speak to that. I
6 think you should ask them directly.

7 Q. It is apparent from that, I take it,
8 that that is not a subject of discussion between you
9 and them.

10 A. No. It is not our objective to
11 prepare a forecast with sort of some weighting function
12 in mind as to whether or not - being too high or too
13 low, if that is what you are really getting at - is of
14 more consequence sequence to the system or not.

15 The intent is to present a forecast, as
16 we see it, of load and how it is going to evolve. We
17 leave it to the system planners to plan from that.

18 Q. Let me turn to the subject, Mr.
19 Burke, of your past forecasts, if I might, and the
20 topic of forecasting in Ontario Hydro more generally.

21 Let me first deal with one aspect of that
22 and that is the forecast of the price of electricity.

23 Do I understand from your previous
24 evidence that the forecast of future real price of
25 electricity is not a forecast which is generated within

1 the economics and load forecast division?

2 A. That's correct.

3 Q. And I think, Mr. Rothman, you spoke
4 about this earlier. I believe you said that at the
5 time the 1988 forecast was prepared, you were provided
6 with a forecast of future real price of electricity
7 which, in fact, saw a decline in that real price over
8 time.

9 MR. ROTHMAN: A. I think that was
10 correct. I think it is that year.

11 Q. And did I also understand you to say
12 that you didn't believe that to be accurate?

13 A. I did not specify the year in which
14 we didn't use the forecast with which we were provided.

15 In that year, the real rate of decline
16 was gradual and we did use that forecast.

17 Q. As I recollect it, you said - and I
18 thought it was with reference to that year. You can
19 correct me if I am wrong - that you didn't see that
20 there -- or didn't believe there would be that gradual
21 decline and you, in fact, used a flat projection of no
22 change in the real price.

23 MR. CAMPBELL: I think you will have to
24 check --

25 THE CHAIRMAN: Hold it. No, just let the

1 witness answer, please.

2 MR. BURKE: Can I suggest what I recall
3 about the use of the prices in the load forecast?

4 MR. MARK: Q. Maybe Mr. Rothman can tell
5 me if he said that or not and then we will...

6 MR. ROTHMAN: A. I don't recall
7 referring to any specific years. There were years when
8 we rejected the forecast of falling real prices.

9 There was a year, and Mr. Burke tells me
10 it was this year, in which we accepted a forecast of a
11 slight decline in real prices and used that for the
12 load forecast.

13 MR. BURKE: A. Certainly in the period
14 before 1988, I think that is the period to which Mr.
15 Rothman was referring when he said there were forecasts
16 of prices that declined significantly in real terms and
17 which we did not use.

18 Q. And do I have it correctly that you
19 didn't use them because you questioned their accuracy.

20 MR. ROTHMAN: A. I questioned when the
21 retail prices, the prices to our customers, would
22 actually fall in real terms.

23 I don't have a lot of expertise in what
24 is likely to happen to Ontario Hydro costs, but looking
25 both at history and at the future, I felt that if

1 Ontario Hydro costs did behave in such a way as to make
2 real prices decline significantly, there would likely
3 be some kind of action that would prevent them from
4 doing so.

5 In particular, I would expect that there
6 might be some kind of tax on electricity, as indeed
7 there has been one in the intervening years, that would
8 take up whatever difference there might be between
9 Ontario Hydro's prices as determined by Ontario Hydro's
10 costs and the inflation rate.

11 So, remember as I said, those price
12 forecasts that we get are entirely a function of the
13 cost projections that are given to the corporate
14 financial planning and reporting division.

15 Q. So what you are telling me is that
16 you bring to bear on that rather mechanical function
17 the judgment of an economist?

18 A. Yes.

19 Q. Certainly we have had since your 1988
20 forecast and your 1990 forecast a significant change in
21 the corporation's projection of real prices of
22 electricity over the planning horizon.

23 A. Yes.

24 Q. And we have gone from a zero per cent
25 change to an increase of 20 per cent in real prices to

1 the year 2015?

2 A. It is about that. I think it was --
3 24 per cent is what number that was in my direct
4 evidence.

5 Q. And what are the factors, as you
6 understand them, which have contributed to the revision
7 of that forecast of real prices of electricity?

8 A. Over the short run, they have been
9 increases in projected costs - throughout the
10 corporation - have been increases in projected costs
11 for environmental, for meeting environmental
12 regulation, increases in projected operating costs and
13 increases in projected costs of simply maintaining the
14 existing system.

15 Part of that can be attributed to simply
16 a better planning process and to operating units within
17 Ontario Hydro thinking more carefully and projecting
18 more clearly what it actually is going to cost to
19 operate this system over the medium term.

20 So, a lot of that price increase comes in
21 the next four or five years, about which we have better
22 cost information. And that information was, again,
23 provided to the corporate financial planning and
24 reporting division and simply reflected in their
25 financial projections.

1 Q. The increase -- the costs that you
2 have been speaking about, are these costs which result
3 from some events which have intervened in these two
4 years, or are they simply projections of costs which
5 weren't realistically made but could fairly have been
6 predicted back in '88?

7 A. Now, as I think I said, we are
8 getting beyond my area of expertise. I have some
9 general information about what has happened with that
10 costing process, but I am neither an accountant nor a
11 cost engineer. I really don't think I can offer an
12 opinion on whether the original cost predictions were
13 or were not realistic.

14 Q. As the chief economist, have you
15 undertaken any sort of review of those cost forecasts
16 to satisfy yourself that they are accurate?

17 A. No.

18 Q. Do you know whether there has been
19 any change in the price forecasting methodology used by
20 the financial forecasting department?

21 A. There has been no change that I know
22 of, but I think you would be better advised to ask
23 somebody from that division.

24 Q. Mr. Burke, could you please turn up
25 Interrogatory 1.9.2?

1 MR. BURKE: A. I have it.

2 Q. And this is a table which gives your
3 one-year-ahead and two-year-ahead load forecasts for
4 the years 1980 through 1989, correct?

5 A. That's correct.

6 Q. And compares it with the actuals?

7 A. Yes.

8 Q. All right. So we understand how to
9 read this chart properly, as I understand it, Mr.
10 Burke, to be able to compare your forecast with the
11 actual result, one would read diagonally, so to speak,
12 from either direction; for example, if you wanted to
13 see the accuracy of your forecast made in --

14 A. Except for those years that have the
15 asterisks.

16 Q. Yes. So, if you want to look at the
17 accuracy of your forecast for the year 1984, if we
18 start with the actual in 1984 at 112.3 terawatthours,
19 the one-year-ahead forecast made for that in 1983 was
20 109, and the two-year-ahead forecast for 1984 made in
21 1982 was 108.1?

22 A. That is my understanding of this
23 table, too.

24 Q. And, of course we can figure that out
25 because isn't it fair to say that over the period

1 represented here, if we take the period after 1982,
2 Ontario Hydro has consistly underforecast with its
3 one-year-ahead and two-year-ahead forecasts?

4 A. Yes. This table stops in 1989. That
5 holds up to 1989.

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1 [4:00 p.m.] Q. Fair enough. And can you now tell us
2 what you believe were the main reasons for the
3 underforecasting during those years?

4 A. Well, I believe they are fairly well
5 described in the interrogatory response itself; that is
6 that forecasts prepared after the recesssion
7 understated the extent to which GDP would be bound in
8 Ontario for a few years. Having experienced phenomenal
9 growth for several years in GDP in Ontario, people
10 forecasting then expected that this level of growth
11 could not be sustained and we would have to have a
12 downturn of some sort whose arrival did not -- was
13 delayed several years, and so both effects tended to
14 result in forecasts that understated what turned out to
15 be the growth both for the economy and for load in that
16 period.

17 Q. So, would it be fair to say that the
18 largest contributor to the underforecasting was the
19 inability - which I don't suggest was yours alone - but
20 the inability to accurately predict the levels of
21 economic activity?

22 A. That's correct. We have been
23 discussing the role that GDP uncertainty has in the
24 load forecast and in the short-term we have said that
25 it is very volatile so that the sorts of errors here

1 are large but not inconceivable given the volatility we
2 have pointed out.

3 Q. Could you now turn up for me, please,
4 Mr. Burke, Interrogatory Response 1.9.3, and this shows
5 your five-and-ten-year-ahead forecasts made in each of
6 the years 1960, 1971, 1976 and 1980.

7 A. Yes.

8 Q. If we start with the 1960 load
9 forecast we see the forecast and the actuals for both
10 and then we have the error in percentage terms in the
11 right-hand column, your 5-year forecast was on the
12 positive side or over-forecast by 4.4 per cent, and the
13 10-year underforecast by 5.1 per cent. Am I reading
14 that correctly?

15 A. Yes.

16 Q. Would it be fair to characterize
17 those errors are relatively small?

18 A. Yes.

19 Q. And if we move ahead to the 1971 load
20 forecast, we see that you over forecast for the 1975
21 year by 9.6 per cent but you over forecast for 1980 by
22 24.4 per cent. Do I have it correctly?

23 A. Yes.

24 Q. And are you able to give an
25 indication today of why the reason for the

1 comparatively large error in the 10-year forecast made
2 in 1971?

3 A. Well, clearly what happened in the
4 middle of the '70s was a major change in trend in
5 electricity demand growth and the forecasts which,
6 prior to about 1976, had been pretty standard seven per
7 cent growth per year for longer term growth, were not
8 valid beyond about 1976.

9 Q. There was a significant change in the
10 economic growth figures, is what you are saying, that
11 wasn't predictable at all?

12 A. No. As a matter of fact, the change
13 in load is, in this case, much greater than the change
14 in GDP. The GDP growth in the '60s was about five per
15 cent per annum, and I think in the '70s about three per
16 cent? But I would say that the swing in electricity
17 demand from numbers like about seven per cent to
18 three-and-a-half per cent was a larger change than the
19 change in the GDP growth itself. And that's reflected,
20 I guess, in the intensity numbers, when I think of it.

21 Q. That's right.

22 A. Yes, certainly we went from about 1.3
23 to one, and so it's not reflecting the change in GDP.

24 Q. Is it fair to say that what
25 intervened in those longer term forecasts in any event

1 were significant changes in some major patterns that
2 were simply not foreseeable?

3 A. Well, I think the full extent of the
4 change in trend probably was not predictable in the
5 early '70s. I think that if we were to use the sort of
6 methodology for forecasting that we have available
7 today and the amount of information that we have
8 available today, that we would have been able to do --
9 I mean, this is pure hindsight here, it really gives
10 great vision. We should have been able to do a better
11 job of anticipating some of these changes in trends,
12 and that was, in fact, the reason why these methods
13 were developed, that given the experience of the late
14 '70s it was clear that a much more disaggregated
15 approach to electricity demand analysis was necessary.

16 Q. Would you agree with me that one of
17 the major contributors to the problem of forecasting,
18 the error we see in forecasting over the period 1971 to
19 1980 was the oil price shock?

20 A. Well, from what I said this morning,
21 it in itself probably was not a major individual
22 factor.

23 Q. But it had an income effect which in
24 turn --

25 A. It had an income effect. It was part

1 of the many things that lowered GDP growth rates in the
2 '70s. But we have talked about a lot of the
3 compositional shifts that started in the early '70s and
4 continued through the '70s in the mix of Ontario
5 industry and the mix in the commercial sector which
6 also contributed to this. There were major changes
7 demographically that were going on as well, with the
8 passing through of the baby boom into the labour force
9 that affected productivity growth in the '70s.

10 There are many things that happened at
11 the same time, and the oil price shock itself certainly
12 exacerbated things but it was not, from the point of
13 view of electricity demand, probably a major cause in
14 the change in trend.

15 It would have probably been expected at
16 the time that an increase in oil prices ought to have
17 increased electricity demand, but, you know, that's not
18 what happened. So that the oil price shock is hard to
19 sort of pinpoint except for an income effect. I mean,
20 certainly the oil price shock is given key
21 responsibility for the recession that occurred in 1975,
22 it took about two per cent off growth. But, I think
23 most analysts don't see the long run impact of the oil
24 price shock on GDP as more than a few per cent
25 long-term. And now of course we have gone the other

1 way, the oil prices have come down.

2 Q. Can I take it from what you have just
3 said that was really unpredictable was the income
4 effect on consumption of electricity that derived from
5 the oil price shock?

6 A. Perhaps. But I guess I am trying to
7 say that in a trying to explain a change from a 7 per
8 cent growth rate to a three to three-and-a-half per
9 cent growth rate, you don't get very far just looking
10 at the oil price shock alone.

11 Q. If we turn back to chart No. 2.

12 A. Yes.

13 Q. Would you agree with me from this,
14 Mr. Burke, that looking at this period of 1973, let's
15 say, to 1982, that there is a relatively high
16 correlation again between GDP growth changes and
17 electricity consumption?

18 A. Yes.

19 Q. And is it fair to say that in 1971,
20 it was simply not possible to predict the types of
21 changes in GDP that we see represented on the graph in
22 chart 2?

23 A. Well, I really don't know how to
24 answer that question.

25 Clearly in 1971 it was not predicted.

1 Whether it was possible to predict were we to go about
2 trying to forecast the way we do things today, I really
3 can't say.

4 MR. ROTHMAN: A. Perhaps, Mr. Mark, I
5 might comment that I think it would have been very
6 difficult to have predicted the kind of cyclical
7 pattern that occurred in GDP growth between 1971 and
8 1981. I continue to think that it is very difficult to
9 predict cyclical patterns, especially -- well, this one
10 actually isn't a very extreme one. If you compare it,
11 for example, to the cyclical pattern from 1980 through
12 1990, the pattern from 1971 through 1980 doesn't show
13 as wide swings, doesn't get to below zero growth.

14 I think that it might have been, it would
15 have been more possible to have predicted the trend
16 rate of growth through the '70s than it would have been
17 to have predicted those cyclical swings.

18 I wouldn't have called it an easy task in
19 either case, largely, as we have said, because we think
20 that there was a break in the trend that occurred in
21 the middle of that period which makes it much more
22 difficult to forecast.

23 Q. If we look ahead at your 1986 load
24 forecast -- pardon me, your 1976 load forecast, item
25 No. 3 in interrogatory response, we see an even more

1 marked errors in the forecast, and either Mr. Burke or
2 Mr. Rothman, can you, with hindsight, give us some
3 insight as to the origins and responsibility for these
4 errors?

5 MR. BURKE: A. I think it is pretty well
6 the same picture. In 1976 the forecast that was
7 produced was still a forecast of 7 per cent growth, and
8 clearly that is the year that that ceased to be a very
9 good forecast for some time to come.

10 Q. And and I take it nobody is now
11 predicting a return to anywhere near what was perceived
12 at the time to be a longer term trend of about 7 per
13 cent in the GDP?

14 A. In load.

15 Q. In the load, pardon me.

16 A. Well, no, and we have pointed out
17 that if you decompose the load growth into the
18 components of GDP growth and intensity change, that we
19 have a declining potential growth for GDP. So that
20 while, in the '60s, five per cent growth was feasible
21 given the demographics and so on, in the '90s three per
22 cent is feasible, and where 1.3 was the intensity, so
23 that you got nearly seven per cent growth in load, we
24 are now forecasting an intensity that's less than one,
25 just less than one. ...

1 [4:17 p.m.] So, the combination of the two explains
2 the change in the forecast.

3 Q. And if, in either of the years 1971
4 or 1976, you had, in fact, done something in the nature
5 of a 20-year forecast, is it fair to assume that you
6 would have incorporated various assumptions and beliefs
7 which would have resulted in some very significant
8 error in those 25-year forecasts?

9 A. Well, the forecasts were made at
10 seven per cent in those years. I think pictures of all
11 our forecasts were supplied in Interrogatory 1.6.42 and
12 showing their evolution through time and the actuals.

13 Q. Mr. Burke, could you turn to chart
14 No. 8 in Exhibit 102, and you'll see what's been done
15 here, Mr. Burke, is to chart for each of the forecasts
16 made in 1971 and 1976 your 5-year forecast, your
17 10-year forecast, the previous five years' growth, the
18 previous 10 year's growth, the post-war growth up until
19 that time and, in each case, to add, as well, the
20 actuals.

21 A. Yes.

22 Q. All right. And so we see that in
23 1971 you were forecasting load growth at levels which
24 were quite similar to the levels that had been
25 experienced in any of those three periods you may care

1 to look at, the 5-year period or the 10-year period or
2 the entire post-war period?

3 A. I wasn't doing much load forecasting
4 at all back then but, yes, those forecasts were
5 prepared.

6 Q. All right. And when we get to 1976
7 you are still, at that point, forecasting a level of
8 load growth which is very much consistent, certainly,
9 with the post-war growth that had been experienced to
10 that point?

11 A. Yes.

12 Q. And do you have any sense, Mr. Burke,
13 of how the long-term load growth that we're seeing
14 there of something over 7 per cent in the post-war
15 period compared with the load growth, say, in the U.S.
16 for a comparable time? Have you ever looked at that?

17 A. I've looked at it. I don't recall
18 the numbers offhand, but I think they're very close to
19 ours, they may be slightly slower.

20 Q. Have you had occasion or been able to
21 compare your history of forecast accuracy for the 70s
22 and the 80s with other utilities in North America?

23 A. We haven't done this in a systematic
24 way, but I think pretty well every utility in North
25 America had a similar experience. The only issue was

1 perhaps which year the forecasts started to come down
2 and how rapidly.

3 Q. And leaving aside for a moment
4 whatever one might think about the ability of your
5 models to correct -- or the improvement of your models
6 to date to see some of these cycles, you're not aware
7 of any utilities in North America, certainly, that were
8 able to predict these events which we see here with any
9 greater accuracy than you were back then?

10 A. Not to my knowledge.

11 Q. Mr. Burke, I think you had some
12 discussion with Mr. Campbell during your
13 examination-in-chief about this issue of targeting and
14 forecasting; do you recall that?

15 A. Yes.

16 Q. And as I recollect your testimony -
17 and I want to be sure I understand it - you said there
18 are uncertainties associated with targeting as well as
19 with forecasting?

20 A. Yes. What I meant by that was that
21 if you're hoping that by choosing a particular level,
22 say, for load for some year in the future and hope to
23 achieve that level for load, that the things that one
24 would have to do to achieve sort of steering demand to
25 that target are highly uncertain because, in practice,

1 it is -- there is no stable backdrop against which to
2 plan your goal-seeking efforts.

3 Load is inherently variable and all of
4 the factors which go into making demand uncertain
5 remain whether people choose a target or not, and so
6 you don't somehow magically make all these things
7 disappear by specifying a target in the future.

8 If you're pushing against -- you know,
9 the example I gave was zero per cent growth versus the
10 growth in the basic load forecast; if you think you're
11 up against a normal 2.3 per cent growth rate over 25
12 years and, in fact, it's a three-point-something per
13 cent growth rate that you're up against, or it's a 1.7
14 per cent growth rate that you're up against, then it
15 makes a difference to what you are planning to do. And
16 you essentially don't remove that inherent uncertainty
17 by having chosen the target.

18 Q. Maybe we can try and break this down
19 a little bit more. Is one of the things that you have
20 to be able to forecast to some degree what the
21 consumption level would have been in any event?

22 A. Yes, that was my major point, that is
23 what we try to do with the basic load forecast.

24 Q. And assuming one can choose a target,
25 then are there things you have to forecast which

1 represent the methodologies of achieving the
2 consumption level you want?

3 A. The sort of exercise we go through in
4 order to determine our electrical efficiency
5 improvement program impact forecast, figuring out how
6 much we are going to save in each and every end-use and
7 so on by certain programs. That sort of exercise has
8 to be done, but it has to be very flexible because if
9 you've set yourself a target you have to be able to
10 expand that or contract it quite significantly.

11 Q. And would you in turn have to be
12 involved in an assessment of the impact of these
13 policies on GDP in order to see whether there is going
14 to be any sort of income effect as we've seen in other
15 cases?

16 A. Well, it certainly depends on how you
17 choose to achieve your target and, as I said, the
18 nature of electricity demand is such that - I think I
19 used the word pervasive - that to achieve major shifts
20 in the demand growth, and I think to understand what
21 constitutes a major shift you have to start getting
22 into the analysis of what's entailed, even just to
23 achieve what Hydro is currently planning to achieve
24 through its own programs, you have to probably change
25 some of the mechanisms in the economy or some of the

1 institutional relationships we have.

2 And these may have economic impacts and,
3 yes, those should be factored into any decision to
4 embark on such a path.

5 Q. Is Ontario Hydro in a position at all
6 to assess or forecast these types of socio-economic, or
7 even just the economic or economy-wide, implications
8 that may result from a targeting process?

9 A. We have some of the pieces of the
10 puzzle, it probably depends on what sort of targets are
11 set, what sort of mechanisms are conceived of, but we
12 probably don't have all of them at this point.

13 Q. Mr. Rothman, if I could turn to you
14 now, please, I want to deal with some of the economic
15 forecasts that you've spoken of.

16 We have dealt with the real price of
17 electricity. Let's turn for a moment to your
18 demographic assumptions, and if I could have you turn
19 to Interrogatory 1.9.6.

20 MR. ROTHMAN: A. Okay.

21 Q. And this is a summary of yours and
22 comparative forecasts of labour force and GDP in the
23 time periods referred to?

24 A. Yes.

25 Q. And if we look at the three periods

1 for 1996 and beyond; that is, the third, fourth and
2 fifth columns, is it fair to say that in the period
3 1996 to 2000 your forecast with respect to labour force
4 is at the low end of the range?

5 A. Yes.

6 Q. And, similarly, although admittedly
7 there is only one comparison point for the period 2001
8 to 2005, you are the lower of the two forecasts;
9 correct?

10 A. Yes.

11 Q. And you come in the same as
12 Informetrica, which is the only other forecast for the
13 period 2006 to 2010?

14 A. Yes.

15 Q. Have you made any analysis of why you
16 are at the low end of the range or certainly no higher
17 than anyone else?

18 A. I believe that we have. To the
19 extent that I believe that the person who does our
20 demographic forecasting has had some discussion with at
21 least Informetrica and I think some of the other
22 forecasters on their driving assumptions for their
23 demographic forecasts, but I couldn't tell you what the
24 outcome of those discussions was.

25 I do know that these demographic

1 forecasts are higher than they had been in the previous
2 year -- our demographic forecasts are higher than they
3 had been in the previous year, at least partly because
4 of the discussions that we had at our external load
5 forecast advisory committee meeting and subsequently
6 about our 1989 forecast.

7 Q. Do you know whether there are any
8 differing assumptions being made by yourself and the
9 other forecasters referred to, for example, for the
10 period 1996 to 2000?

11 A. As I said, I think that the relevant
12 member of my staff knows what the differing assumptions
13 are, but I don't know.
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...

1 4:32 p.m. I would point out that these differences
2 are actually fairly small. While we said that our
3 forecast was lowest for the period 1996 to 2,000, our
4 forecast is for a labour force growth rate of 1.2 per
5 cent per year as compared to DRI's of 1.3 per cent,
6 Informetrica's 1.4 per cent and Wharton's of 1.5 per
7 cent.

8 So that we are talking cumulatively at
9 the end of a period of an average -- of the difference
10 between the lowest and the highest of 1-1/2 per cent or
11 so of total labour force. That is not insignificant
12 and I don't want to minimize it.

13 I said in my evidence in-chief in an
14 answer to Mr. Rodger that we had forecast that the Free
15 Trade Agreement would produce a difference in GDP
16 growth of 3 per cent and I wouldn't want to minimize
17 that. But within the range of forecast error, errors
18 of 1-1/2 per cent or so over a period of five years are
19 not large. So, I would not characterize these
20 differences as large differences, though they are
21 differences.

22 Q. In terms of getting from the labour
23 force to GDP, am I correct that for your long-run
24 projections, it is a direct sum of your projection of
25 your change in employment and your projection in the

1 change in productivity?

2 A. We actually have come back at it the
3 other way; that is, because of the way that this
4 forecast was made, there isn't a direct factor within
5 it of labour productivity.

6 And so, we made the forecast and then we
7 know what the labour force growth forecast was. From
8 that we can infer what the productivity growth forecast
9 was, but we didn't kind of put them together in that
10 way.

11 Q. I had understood, Mr. Rothman -
12 correct me if I am wrong - that to forecast long-term
13 economic growth, Ontario Hydro combines its forecast of
14 labour force growth and productivity growth to yield
15 the GPP.

16 A. Yes. As I explained or tried to -
17 perhaps I wasn't as successful as I thought I was
18 being - as I explained in my evidence in-chief and
19 subsequently, productivity is a very complex factor.
20 And thinking of GDP growth as the combination of labour
21 force growth and productivity growth is an not
22 incorrect, but a simplified way of looking at that
23 process.

24 Our forecast process does that GDP
25 forecast with a model that includes directly the

1 factors of labour force, effectively technological
2 change, energy prices and capital. And it is through
3 that interaction that we get our GDP growth; then
4 productivity growth can be inferred as what you would
5 needed to have had to have produced that economic
6 growth.

7 Q. So the derived figure then seems to
8 be the productivity?

9 A. Yes. If we were doing it in that
10 simplistic way, we wouldn't really need models. If we
11 knew what the productivity growth would be and the
12 labour force productivity would be, we would just add
13 them up.

14 We have described it that way in the
15 Demand/Supply Plan Report because it is not an
16 incorrect -- as I said, it is a useful way of looking
17 at it, but it is not a description of the direction in
18 which we go about the forecast.

19 Q. But am I correct that you,
20 nonetheless, try to make

21 A. We were just checking. I don't think
22 these mikes are on; is that right?

23 Q. Nobody is having difficulty.

24 A. Well, yes. I have quite a loud
25 enough voice.

1 THE CHAIRMAN: I thought you wouldn't
2 draw attention to that. I have noticed they haven't
3 been on for some time, but I thought maybe you had done
4 it deliberately. (Laughter)

5 MR. ROTHMAN: These buttons here -- the
6 button, at least on my mike, doesn't work at all. It
7 doesn't do anything or hasn't in the past. So, to shut
8 them off, you have to hold the buttons down on the
9 others.

10 But that is okay. Nobody seems to be
11 suffering, so ...

12 MR. MARK: Q. If we look at chart 9 in
13 Exhibit 102 -- do you have that, Mr. Rothman?

14 MR. ROTHMAN: A. Yes, I have it.

15 Q. Comparing your projections for some
16 items between the plan and the update, for
17 productivity, we see a change in productivity, a
18 decrease from 1.7 to 1.4.

19 And you will pardon on me if I am taking
20 a bit of time, because I rather understood you to do
21 the process differently, and let me make sure I do
22 understand it.

23 Is this number just a derivation from
24 everything else or is this a number which you either
25 arrive at independently or, at least, check or verify

1 with some independent analysis?

2 A. That is a good point, Mr. Mark. It
3 is not a one round. We don't sort of set the model to
4 chugging the law. We get from it a productivity growth
5 and GDP growth and that is what we have got.

6 As I testified earlier, we have a look at
7 that productivity growth that the model produces on it
8 its own and apply some judgment to the question of
9 whether that is a likely outcome or not, and run it
10 back through to get the growth rate which we have
11 forecast in the end.

12 Now, the process was slightly different
13 at the time of the plan because we were using a
14 different model. At that time, we were using the Ontec
15 model.

16 And I suspect - though I would have to
17 check - that we may have fed more of that model a
18 little bit more. That model required a lot more
19 explicit judgment in the form of add factors than does
20 the LISA model.

21 And so, there may have been a closer
22 focus on the productivity growth because that was the
23 way it was add-factored in. That was the variable that
24 was looked at at time we were add-factoring the model.
25 I don't know exactly how the model was run at that

1 time.

2 Q. So, is it Ontec that produced the
3 projection of 1.7 per cent underlying the plan?

4 As I understand, when you brought LISA
5 into operation it would have been, or am I wrong?

6 A. I think it is safe to say that it was
7 LISA that -- well, the projection that we have now is
8 produced by judgment applied to the results from LISA.

9 I think it is probably safe to say that
10 the 1.7 per cent was produced by judgment applied to
11 the results of Ontec.

12 Q. Let me just stop you there. Do you
13 recall what the actual Ontec forecast was before you
14 judgmentally pegged it at 1.7?

15 A. No.

16 Q. Is that a number you could possibly
17 get for us? It doesn't have to be right now.

18 A. I should be able to get some further
19 information on this from staff, yes.

20 MR. MARK: Mr. Chairman, I think this is
21 the first time that we reached the subject of
22 transcript undertakings, which is a practice that most
23 of us here are used to.

24 I don't know if you have given any
25 thought to it, but the regime we usually employ if

1 matters such as this come up where it is not productive
2 to have the witness look for the answer now, we accept
3 an undertaking and have it --

4 THE CHAIRMAN: He said he would do it.
5 And this morning, Mr. Campbell reviewed all those
6 things. If it is required to become formalized, we
7 will do so.

8 MR. MARK: All right. If it becomes
9 cumbersome, we can deal with it.

10 THE CHAIRMAN: Up to this point, I don't
11 think we need to be that formal. If he says he will
12 try to get it, he will try to get it.

13 MR. MONGER: Mr. Chairman, your
14 microphones are off as well. We can't hear you.

15 THE CHAIRMAN: Well, I know my
16 microphone -- you couldn't hear me?

17 MR. MONGER: No.

18 THE CHAIRMAN: I just said we wouldn't
19 formalize at this point. I hope it won't be necessary
20 to do so throughout the hearing. If it becomes
21 necessary to formalize these kind of undertakings, we
22 will do so, but right now I don't see any need for
23 that.

24 Mr. Rothman says he will try and get the
25 information and I expect he will.

1 MR. MARK: Q. In both cases, you
2 obviously apply judgment; you turn your mind to the
3 issue as you said.

4 Can you tell me why, in summary fashion,
5 the reduction from 1.7 to 1.4 between plan and update
6 in productivity? I am assuming you have compared them.
7 When you made the assessment of 1.4, you must have had
8 regard to what you had said in the 1988 projection.

9 MR. ROTHMAN: A. I think our judgment
10 has been at least partly based on an expectation of
11 greater environmental regulation and perhaps on a view
12 of Canada's competitiveness in some industries, but I
13 think that the -- that is enough.

14 MR. MARK: Mr. Chairman, I am about to
15 turn to another significant area of the economic
16 forecast. It may take some time. And frankly, there
17 is some evidence that came out just now on this issue
18 that I would like to consider and consult over before
19 continuing.

20 Would this be an appropriate place to
21 break for the day?

22 THE CHAIRMAN: How much longer to do you
23 think you are going to be? Have you got any update on
24 that?

25 MR. MARK: In the area of two hours.

1 THE CHAIRMAN: In the area of two hours.

2 Mr. Rogers was here this morning --

3 MR. RODGER: Yes.

4 THE CHAIRMAN: Okay. You are Mr. Rodger.

5 How long do you think you will be in your
6 load questions having regard to the questions that have
7 been asked today?

8 MR. RODGER: Well, Mr. Mark has covered a
9 lot of the ground and that I intended to cover. So
10 depending on what he proceeds on on Monday, I would
11 expect to be no more than about an hour and a half.

12 THE CHAIRMAN: Yes.

13 Mr. Rogers was here this morning, but I
14 don't see him.

15 Is anyone here from his office?

16 MR. CAMPBELL: I don't think anyone is
17 here from his office, but he asked me if the matter
18 came up to advise the Board that --

19 THE CHAIRMAN: Are you from Mr. Rogers's
20 office?

21 MR. VERWEGEN: I believe Mr. Campbell was
22 in discussion with Mr. Rogers.

23 THE CHAIRMAN: All right.

24 MR. CAMPBELL: Got his signals crossed.

25 But anyway, I was asked to speak to the matter if it

1 came up and indicate that Mr. Rogers expected to be
2 fairly short. And I would say if you allowed a half an
3 hour, that would be more than adequate.

4 THE CHAIRMAN: And that is for both his
5 clients or just one of them?

6 He has got two clients. He has got a
7 colleague who is going to act for the North Channel
8 Advocates.

9 Do you know about that?

10 MR. VERWEGEN: I am sorry, Mr. Chairman,
11 I cannot hear you.

12 THE CHAIRMAN: They can't hear, oh. Mr.
13 Rogers's firm acts for two of the intervenors: One is
14 the Ontario Natural Gas Association and the other is
15 the North Channel Advocates.

16 I think he said a Ms. McDowell, if I can
17 remember the name correctly, was going to deal with
18 one.

19 You don't know anything about that?

20 MR. VERWEGEN: No, I know nothing about
21 that.

22 MR. RODGER: I think I might be able to
23 help, Mr. Chairman - the 'single Rodger.' I had an
24 arrangement with the North Channel Advocates that some
25 of their key concerns would be included within my

1 cross-examination for the load forecast.

2 So I am under the impression that my
3 cross will cover the North Channel's concerns.

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1 [4:45 p.m.] THE CHAIRMAN: So depending on how we do
2 with Panel 2 scoping then, Mr. Poch, there is a chance
3 that you may be starting on Monday.

4 MR. POCH: Yes, that is fine, sir.

5 THE CHAIRMAN: I guess we can now adjourn
6 until Monday morning at nine o'clock, that's for the
7 scoping session on Panel 2. This part of the
8 proceedings won't start any earlier than ten o'clock,
9 it may even be later; it won't be earlier.

10 THE REGISTRAR: We are therefore
11 adjourned until 9:00 a.m. Monday morning next.

12 ---Whereupon the hearing was adjourned at 4:47 p.m. to
13 be resumed on Monday, April 29, 1991 at 9:00 a.m.
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